JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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VOL. XCVI., No. 2273.—TUESDAY, DECEMBER 4, 1906.

EDITORIAL NOTES—GAS, &c.

By Way of Contrast.

WHILE the majority of the technical officials of the gas industry are in accord upon the question of the advantage of thorough and regulated technical research, and inquiry into other matters of common importance to the industry, there is a lugubrious amount of indifference as to how, and by what means, such work shall be done. Things are, as Sir George Livesey once said, left very much to chance in the British gas industry; and things that are left to chance sometimes, fortunately, work out right. But at other times they do not; and the industry is so much the worse for it. It may be said by the optimistically inclined that, up to the present, the industry has done very well. This everyone freely and thankfully admits. But is it not possible that it might, under other circumstances, have done even better? We see no sign of a slowing-down of the industry's prosperity; but, with competition besetting, we do see the greater difficulties that the industry will have to contend with in future. The productive costs and selling prices of electricity are being gradually but surely decreased; and energy is unremitting in the quest for more economical electric lamps. And, within, the problems connected with gas manufacture are getting more and more complex, and require, for their best solution, the combination of intelligence of the first magnitude, and increasing expense is involved which ought not to be an individual obligation. Prudence and foresight are inseparable; and prudence and foresight warn us that the industry in the future will be all the stronger for the application to its technical, practical, and commercial work of all the lessons that can be brought together by invoking the assistance of well-ordered scientific investigation. This has been recognized in most of the other great industries of the country; the only difference between them and those of gas and electricity being that the former are not under statutory control, and in them competition is free. The gas industry taken as a whole—we could, however, mention several undertakings that could claim exemption—appears to desire to individualize itself for severe uncharitableness towards research, though ever ready to gather with eager hand the best of the fruits.

Superiority and deficiency, richness and poorness, greatness and littleness, and such-like, are all qualities that can be most strikingly presented by comparison. The poverty of our own Institution, through the withholding of material support to the establishment of investigation work has recently been pointedly brought to view in our columns. The amount placed at their command for special purposes by the undertakings of the industry, is really so modest that not one of our readers who have interested themselves in the matter will need its repetition to serve as a reminder. But we ask readers to recall the several figures, and then compare them with what is done in Germany by the gas undertakings in supplying the means which prompt, stimulate, and permit of research. We are granted an insight into this by the communication which it is a privilege to publish to-day from Herr E. Körting, the accomplished Chief Engineer of the Berlin works of the Imperial Continental Gas Association, and which communication was made at our request in the hope that the information might lead to emulation in this country. What is done in connection with the French Gas Society was described by Mr. C. E. Brackenbury in our "Correspondence" columns three weeks ago. Why, we ask, should the gas industry of Great Britain be behind that of France or of Germany in this support of technical work? The comparison that can be made does not exhibit the gas undertakings of this country in the most favourable of lights, nor does it say much for their recognition of responsibility, in this particular regard. For many years there have been in Germany several gas undertakings which have made special contributions to the professional organization for the furtherance of technical research; and Herr Körting tells us that from 64 such voluntary contributors, the sum of £625 is annually received for scientific purposes, and no part of it is earmarked by the subscribers for any special scientific object. Incidentally, it may be pointed out that the Imperial Continental Gas Association alone grant £125 per annum. If, too, the relationship between the grants and the contributors' outputs are considered, it will at once be seen that the average subscription is above the 6d. per million cubic feet suggested by the Council of the Institution for the guidance of the gas undertakings of this country. Another source of revenue is £500 from the "Journal für Gasbeleuchtung," which is exclusively the publishing organ of the Association, which has consequently practically a monopoly of gas literature and publication in Germany, and which, furthermore, is largely conducted in agreement with a Committee of a Board of Directors of the Association. Then it was considered some while ago that, in view of the fact that the benefits of the research work of the Association were free to all, there ought to be a more general support of the funds devoted to the purpose. A circular-letter was therefore sent out, inviting contributions, and up to now about £1800 has been received, of which something like half is to be a payment once and for all, and the other half is to be a permanent annual subscription. These are the present sources of the Association's income for technical research; but it is intended to supplement them by approaching the various large industries who owe their prosperity to gas, and whose continued prosperity is dependent upon that of the gas business. It will also be remarked that the Association have an available capital of £4500.

The next point is as to how the German Association dispose of the subsidies from the gas undertakings for technical work. Before the circular-letter was issued, and therefore before the complete experimental works scheme was laid before the gas-supplying authorities of the country, there was no suggestion of the money being devoted to any one special purpose, nor did the administrators of subscribing gas undertakings expect or require any assurance as to the spending of the money on any specific purpose prior to making contribution. They were quite satisfied to know that the research work is either conducted under Dr. Bunte's personal supervision or else by Committees the members of which are selected for their special experience in connection with the subjects taken in hand. But part of the contributions, enlarged in the total in the manner already stated, will now be devoted to the maintenance of the gas-works for experiment and training, in which works science and practice will be conjoined in a manner that cannot fail of excellent reward. All the details can be obtained from the information forwarded by Herr E. Körting. We suggest to the critics of the circular from the Council of the Institution, who urge the necessity of specific statement as to the purpose to which funds are going to be applied, that they direct their attention to the list of subjects quoted by Herr Körting as having been referred to Committees at the last meeting of the Association, either in pursuance of former work or the opening up of new; for the list appeals to us as being eloquent of the confidence of the administrations of German gas undertakings in the professional organization of the country, and in their proper handling of the funds entrusted to them. Grants for research and compilation of statistics authorized at the last meeting of the Association amounted to no less than £1160; and the Association are also committed to the spending of £3500 for the erection of the trial gas-works, and to an annual expenditure in connection therewith of about £500. We can almost feel jealous of the German Association being in a position to indulge in this

considerable expenditure on experimental gas-works, upon the like of which the hearts of some of the leaders in the British gas profession have long been set; but we are apparently as far off attainment as ever. There is much work to be done. Many problems require investigation in connection with plant, processes, utilization, &c.; and is it still to be said that the gas industry of Germany can alone take credit for having the means of attacking these matters seriously and completely? It is the boast of the German Association that for nearly fifty years it has been in the forefront of every technical or financial advance made by the German gas industry; and the creation of these instructional and experimental gas-works will confer upon them increased powers to retain that position. We do not envy them the position; but we should like to equal it. The power and liberty, however, possessed by the German Association are not vouchsafed to our Institution. They are stranded by the indifference or want of appreciation of those who would benefit most by their labours.

We thank Herr Körting for his kind compliance with the suggestion made to him. An investigator of his merit and distinction has sympathy with the aspirations of the Council of the Institution; and we do hope that the account he has given of how the German Association are financed for their technical work, and the liberty they are allowed in pursuing that work, will have the good effect of a worthy example.

Legislation for 1907—Futile Suspensory Clauses.

Following up our reference of last week to the notices for Gas Bills in the coming session, we have now the complete list of projected promotions before us; and it is found that the sum-total of the Gas Bills that Westminster will see is sixteen, excluding two or three composite measures in which there are a few very ordinary clauses referring to gas supply. Additional Bills for incorporation come from Bude and Selsey; and the reincorporations have been added to by a Bill from Boston Spa. No other statutory Gas Companies than those mentioned last week will appear in Parliament in the coming session; but the Penrith District Council will, *inter alia*, seek an extension of their limits, and the Pontypridd Council will ask for, among other powers, the revision of their existing conditions affecting the quality and the testing of gas. One of the most surprising things, after last session's experience, is that there is not a single application entered for purchase. Perhaps the renewed vigour of the attack on municipal trading and the high rates almost generally ruling the country through, are having a salutary restraining effect. Even the Hull Corporation are not taking advantage of the suspensory clause in the East Hull (Sutton, Southcoates, and Drypool) Gas Company's Act. Therefore both suspensory clauses—the Merthyr and the Hull—have been futile so far as purchase promotions go. But something has happened, which may or may not have relation to the suspensory clause in the East Hull Act. The Company are from Jan. 1 going to reduce the price of gas from 2s. 4d. to 2s. per 1000 cubic feet. This is a remarkable drop; and more so when it is remembered that, only on April 1 last, the Company also diminished their charge by 2d. In other words, in nine months there will have been a reduction of 6d. in the price of gas. This has an important bearing upon the gas supply of Hull; for now the East Hull Company will be supplying on equal terms with their large neighbour the British Gaslight Company, while the Corporation who buy gas in bulk at (if we remember rightly) 1s. 6d. per 1000 cubic feet from the British Gas Company for the supply of the area of the defunct Kingston-upon-Hull Gas Company, are charging the consumers 2s. 6d. Turning to the applications to the Board of Trade for Provisional Orders relating to gas supply, there are only seven, and of no great importance; but under the Private Legislation Procedure Scotland Act, the Glasgow, Aberdeen, and Dundee gas undertakings are making applications. It is of interest to observe that part of the application of the Glasgow Corporation will have reference to the illuminating power and the testing of the gas; and, though notices of application give most meagre information, knowing what we do of Mr. Alexander Wilson's views on the worthlessness nowadays of high illuminating power (which views harmonize with those of his predecessor, the late Mr. William Foulis), it is clear the Corporation are going to prepare themselves for giving further effect to the opinion held by their chief technical adviser.

Benzolized Water Gas.

It was a very useful paper that Mr. A. O. Jones, of West Bromwich, presented to the Midland Junior Gas Engineering Association on Saturday; and in it students of the principles of producing water gas have the theory and practice placed before them in, so to speak, a nutshell. There is one preliminary point on which Mr. Jones must be corrected, and that is that up to the present there is only one system of producing blue water gas—the Dellwik—that has been introduced into British gas-works. There is the Kramers and Aarts plant at the Uxbridge Gas-Works, which, we believe, is now undergoing its trial runs, and therefore must to-day be reckoned as an introduction into British gas-works operation. However, that is a small point; but it is well to put the matter right, if only for the sake of historical accuracy. Importance attaches to Mr. Jones's contribution for the practical experience it gives from West Bromwich (where punctilious observation of the manufacturing functions has been a trait over a long course of years) as to what to avoid in the running of the Dellwik plant, and what is the practice best calculated to obtain the highest results. Every operation in water-gas plant has to be studied individually, to ascertain whether a certain course is, on balance, the most profitable. This is seen in the variety of views and practice on points of working in America.

There are many definite points to be gathered from Mr. Jones's paper which can be accepted with faith as a correct representation of West Bromwich experience and practice. From the customer's standpoint, the reduction of the carbonic acid in the gas he uses is of importance. The increased length of blow, it is found, lessens the amount of the carbonic acid in the crude gas to some extent; but *per contra* this means the consumption of extra fuel. And it is questionable whether the reduction of the carbonic acid effected by the increased length of blow compensates for the extra fuel burned, more especially seeing that lime purification is the vogue at West Bromwich. Increased depth of fuel in the generator—that maintained at West Bromwich is about 4 ft. 6 in.—will also reduce the amount of carbonic acid formed during the run; but the increase is likewise found uneconomical for reasons stated in the paper. Of course, the operation of the blow and the shallow depth of fuel are features of the Dellwik plant; and the experience that Mr. Jones gives does not appear to have resulted in the discovery of any improvement on the methods of working approved by Mr. Dellwik. Superheating of the steam has been experimentally tried, but has not been a success, having regard to its effect on the integrity of the plant. In the working of the plant, all things considered, temperature is the chief thing; and this Mr. Jones advocates should be maintained high enough to keep the percentage of carbonic acid in the gas within reasonable limits. Such temperature is probably between 1800° and 2000° Fahr.

The tables of costs that the author supplies will no doubt claim most pointed attention. But we are not convinced by the figures that, supplying a 17-candle gas, the consumers are reaping any particular benefit from the manufacture of benzolized water gas, although, of course, the convenience of the plant to the Engineer, even supplying a gas of such candle power, is indisputable. The cost of the purified water gas, enriched up to 17 candles, is 10·81d.; but of this amount the benzol enrichment represents 6·09d. The 17-candle coal gas costs 12·53d. Now let us suppose (these are not the figures worked to as a rule at West Bromwich) the gas supplied happens to be a mixture of 75 per cent. coal gas and 25 per cent. benzolized water gas. The manufacturing cost of the mixture, we make out to be 12·09d. per 1000 cubic feet, or only 0·44d. per 1000 cubic feet below the cost of the pure coal gas. On the other hand, the calorific power of the mixture is reduced by 8·5 per cent.—that is to say, the calorific power of the coal gas alone is 640 B.Th.U.; and of the 75 and 25 per cent. mixture, 585 B.Th.U. Therefore, unless the consumer directly gets the saving of 0·44d., *plus* the proportion of the saving on capital charges (estimated at ¾d. for the 25 per cent. of water gas), he is, in these times when calorific power is of more importance for heating and power purposes than illuminating power, not gaining any advantage from the addition of the benzolized water gas. We know that this is looking at the matter from a single standpoint, and that industrial users of gas have had every consideration at West Bromwich.

There is another point, however. Mr. Jones says that a comparison of the tests for illuminating power during two

years shows an "average" reduction of 0·36 candle 1½ miles from the works. But he goes on to point out that, when the temperature falls below 28° Fahr., it is found that the gas which was satisfactory at the holder inlet was sometimes as much as 1 candle less when it reached the station governor outlet. In view of this instability of benzol enrichment in cold weather, it would have been of interest if Mr. Jones had given, instead of the average drop, a table showing at different periods of the year the varying temperatures, and the varying losses in illuminating power after travelling through 1½ miles of pipes, because if there is one thing undesirable in these times, it is fluctuations in illuminating and calorific powers. With a reduction of the illuminating power of the gas supplied in West Bromwich, and the consequent diminution of the benzol enrichment called for, representing 6·09d. per 1000 cubic feet of water gas, the conditions, it appears to us, upon the *primâ facie* evidence of the paper, would be more favourable to the West Bromwich blue water-gas plant.

The Kent County Gas "Swindle."

THE promotion of the Kent County Gaslight Company has been partially, but not completely, investigated during the past week before Mr. Justice Joyce; but—though of course it could not be so in the particular circumstances, and for the time being—we wish that the subject of this promotion could have been immediately raised in another form, in another Court, and on an issue the result of which might have effectually broken up this particular nest of company promoters, who (as our repeated attacks on the prospectuses of certain public traps during the last two years have shown), instead of coming out into the open as honest men, do their business under various appellative disguises, and by methods deliberately designed to inveigle the large unsuspecting part of the public. The matter only came before the Court on the applications of 23 shareholders for the removal of their names from the register of the Company, and for the return of their money. But though the whole question was as to whether the applicants had a right to the relief sought on the ground that the prospectus did not represent the facts, the promoters and others who had been associated with them did not leave the Court without a denunciation from the Judge that gives no scope for speculation as to his personal opinion of their characters. In fact, some very significant remarks were made by his Lordship, which remarks we indulge the hope portend of this particular promotion being before the Court for another purpose. Said his Lordship, "There may possibly be at some future time "further investigations into this case." And an opening for investigation is plainly suggested in the part of his judgment where he emphatically says: "I have no hesitation "in saying that the bringing out of this Company, and the "palming of it off on to the public, was nothing more "than a swindle, and that the public have been most grossly "defrauded by some one." That some one or more persons would not be difficult to discover; and men who are accused of company promoting of a kind that, in the opinion of a Judge of the High Court, is nothing better than a swindle, and is devised with deliberate intent to grossly defraud, ought to be brought to account, in order to give them an opportunity of convicting the Judge of error, or the law an opportunity of awarding the miscreants their deserts. The applicants to the Court last week got the relief that they wanted, and will have their money returned to them with interest and costs; and now probably there will be other shareholders who will prefer to have their subscriptions for shares in their pockets rather than in those of such unscrupulous promoters and their satellites.

We have some sympathy with the public and those who have been duped in this Kent County and other promotions. The excellence of gas as a security has long been deep-rooted in the public mind; and among those who favour gas as a safe investment—these promoters and those associated with them know full well—are many who are totally unacquainted with certain base phases of money making, and many who, either from ignorance or from want of circumspection, do not distinguish the weaknesses of prospectuses and the subtleties of wily promoters. The advertisements of such men are even carried into the pages of papers devoted to religious matters; and the homes of unprotected women who rely for the necessities of life on the interest they can obtain from the investment of such capital as they have, are invaded by the meretricious invitations for capital—not for substantial gas concerns, but for the lining of the pockets of rascally purchasers and vendors of insignificant gas-works. Do what one will to oppose them, they achieve their ends in large measure. It seems almost grotesque that these promoters of the Kent County Company should have succeeded in getting, in cash, every penny of the £21,800, which was their price to the public for works that had been purchased for £2350 (and could have been acquired a couple of years before at £1150), and for a work of fiction of their own construction as to a future of great prosperity for gas in a big pastoral district. The capital asked for these works was £50,000! The monstrous and impudent character of what Mr. Justice Joyce characterized as a gross fraud on the public, was exposed by the affidavits of, in the order presented, Mr. R. Bruce Anderson, Mr. Charles Hunt, Mr. Andrew Dougall, and Mr. H. E. Jones. The works in question—the Goudhurst—are selling only about 3½ million cubic feet of gas per annum; and for a number of years until 1901 were only making rather more than a five pound note per annum in profit.

The absolute callousness and indifference to the interests of anyone but themselves on the part of the promoters and the Directors as divulged by the proceedings in Mr. Justice Joyce's Court, and the well-defined care they took to compass their own ends, give an almost romantic touch to the story; and we cannot acquit Mr. S. B. Darwin from censurable conduct for the conspicuous but undignified part he played in connection with this Kent County promotion. No wonder he was alarmed by the newspaper exposure that was immediately made on the appearance of the prospectus; but perhaps it was a good thing for himself he was alarmed before the fraud went further. There was evidence of the prospectus having been open to Mr. Darwin's scrutiny before its issue; and there was also evidence that its misleading character (promptly discerned by outsiders) he had, with all his gas experience, failed to detect, or—we will be merciful by putting the point mildly—had closed his eyes to. But one redeeming feature of his connection with this promotion was the action he subsequently took when he saw the castigation the prospectus received in a financial contemporary, and that action was of material assistance to the applicants before Mr. Justice Joyce last week. However, we trust that this exposure will be the beginning of the end to these pernicious depredatory exploits in connection with the gas industry. We do not want the security offered by the capital invested in that industry to be in any way injured by more such rotten promotions as that of the Kent County Company and others that we and our readers could name. We have hitherto worked to suppress them, have cautioned our readers against them time and again, and have besought Chairmen of Gas Companies to warn their shareholders against parting with their money without scrupulous inquiry into *bona fides* and prospects. For the assistance we rendered, as a duty to the gas industry and the public, in connection with the corrupt Kent County promotion, we have received the thanks of Messrs. Corbould-Ellis and Mitchell, the Solicitors for the petitioners for relief last week. The acknowledgment is gratifying; but we are thanked sufficiently by the knowledge that the work has been in a good cause, and that what has been done, and will be done in the future if necessity arises, has the approbation and support of all honest men in the gas industry. Now it is hoped after what was divulged in Court last week, and after the remarks of his Lordship, that the last has not been heard of this matter, and that something will be done to speedily and effectually stamp out the whole business. Meanwhile, shareholders must still be warned to penetrate deeply before confiding their money to strange keeping, and equally contractors must, if they wish to avoid unnecessary complication and anxiety, be sagacious in regard to their contracts.

Pictorial Misrepresentation.

The electrical people are still busy discussing methods for combating gas. The "Electrical Bulletin" was one of the latest ideas for levelling a blow at the rival; but we are a little doubtful as to whether it is having the expected effect. Consumers apparently do not read the "Bulletins," or, if they read them, the extravagance of statement and distortion of truth are so strikingly manifest that the electricity undertakings, so far as we can gather, do not see the effects of the expenditure on the production of this form of literature returning to them in

increased business. There is really nothing to equal demonstration—something that appeals to the eye; but not demonstration in the form of the pictorial lies that certain electricity departments are now issuing. There is a reproduction of one in "Electrical Industries" for Nov. 21. The original is a coloured poster issued by the Hampstead Corporation Electricity Department. The artist appears to be gifted with an imagination much stronger than his possession of the virtue of truth. The poster is headed "Gas *v.* Electricity." A room the darkness of which suggests an abode in some other place than "the happy land," is supposed to be illuminated by incandescent gas-burners and heated by a gas-fire. The collapsed appearance of a girl sitting in the room suggests that medical attendance is promptly required. A cat, apparently meditating on the momentous question of whether life is worth living, is pictured sitting with its tail in dangerous proximity to the gas-fire; and an ill-conditioned parrot in its cage wears a most dejected look. All this mournfulness is ascribed to the use of gas. The antithesis is, of course, a room lighted and heated by electricity. The Chinese slavery cartoons of the General Election here find their equal at Hampstead for coarse and despicable mendacity. "Electrical Industries" may see fit to congratulate the Hampstead Corporation upon the "effective use" they are making of the talent of a member of their engineering staff. In our opinion, it is talent misplaced; and if the members of the Borough Council are men of honour they will decline to be parties to the continued publication of this highly coloured lie. The public would be better persuaded by a fair example of the accused health-injuring and dull incandescent gas-burner and gas-fire placed on exhibition in the neighbourhood of incandescent electric lamps and electric radiators—costing the ordinary consumer the same amount per hour of use. We suggest to the Hampstead Electricity Department that they should arrange with the Gas Company a display of the kind, if they really want to make an attractive comparison. If they are not prepared to do this, then they ought to withdraw the poster against the falseness of which we strongly protest.

A Weekly Rest-Day Bill.

A Bill has been introduced by Mr. Goddard Clarke, the Liberal member for Peckham, with the support of several members of his party and Mr. Steadman, representing Labour, to provide for each person who is working for an employer having the 24 hours of Sunday as a rest-day in each week; or, when Sunday labour is necessary, having one Sunday of 24 hours uninterrupted in a fortnight, and the day before or the day after the following Sunday to be a free and uninterrupted rest-day. Exception is made in the case of Jews and domestic servants. Every employer who is guilty of an offence under the Act is to be liable to a fine of not less than 20s. and not exceeding £5, together with the costs of the prosecution; but he is to be exempt unless directly responsible. Corporations permitting their employees to work contrary to the provisions of the Act are to be liable to a penalty of not less than £5 nor more than £20 for the first offence, and of not less than £10 and not exceeding £50 for each subsequent one, in addition to any other penalty prescribed by law. Existing Acts relating to Sunday are not to be repealed by the Act under notice; and the provisions of the Shop Hours Act, 1904, relating to offences and proceedings, the appointment, the powers, and the salaries of inspectors, and the expenses of local authorities, are to apply to it. It is proposed that the Act shall come into operation within three months after receiving the Royal Assent; but as the Bill stands No. 42 on the Orders of the Day, and is preceded by 32 Government Orders, the prospect of it reaching this stage is somewhat remote. Meanwhile, the honourable members responsible for it will do well to study the effect of the passing of a similar measure for France about three months ago.

Value of Gas as a Stand-By.

In the "JOURNAL" for the 6th ult., in the paragraph on the lighting of the new hall and buildings at University College, Reading, we called attention to the fact that, though the illumination of the hall was by a "thoroughly well-arranged system of electric light," the authorities were not so confident in it as to trust it entirely, as a gas-jet was "kept alight during the evening use of the building, in case of panic through possible failure of the electric light." That the University authorities were wise to take this precaution has been quickly proved in the case of another building in Reading, as will be seen from a paragraph of the "JOURNAL" on p. 693 to-day. During a concert at Broad Street Congregational Chapel on the evening of the 25th ult., when the building was literally packed with people, the electric light went out, and, upon investigation of the cause, it was found that a wire over a large lantern in the entrance lobby had fused, and had fired the woodwork encasing it. The flame was extinguished before much damage was done, and the current switched off. Fortunately, owing to the presence of mind of the Pastor and the Organist, the coolness of the Stewards, the obedience of the congregation, and last—but certainly by no means least—the fact that there were gas-jets under the galleries and near the organ, which were promptly brought into use, panic was averted. By their light—dim, possibly, but reliable—the concert was brought to a close, and the congregation dispersed, according to the report, "with quiet orderliness." How different it would have been if the darkness had caused a panic. It appears that all the exits, with the exception of a narrow passage, converge upon the central corridor; and, considering the crowded state of the building, these would have been speedily blocked, with disastrous consequences. Those who so admirably controlled the large gathering—consisting largely of women and children—are to be commended, and so are those others who assisted them in doing it by having the gas-jets retained for use in such an emergency.

PERSONAL.

Mr. A. COX (who is a member of the Town Council) has been appointed Manager of the Falmouth Water-Works Company, in succession to his father, the late Mr. J. G. Cox.

Mr. A. KYLE, Assistant to Mr. Isaac Carr at Widnes, has been appointed Gas Engineer and Manager to the Abergavenny Corporation, in succession to Mr. Hubert Russell.

A special meeting of the Belfast Gas Committee was held last Wednesday to consider a letter which had been addressed to them by Mr. JAMES STELFOX resigning the position of Gas Manager, which he has held since 1875, previous to which date he was for some time Assistant-Manager. The Committee decided to accept the resignation with regret, and to request Mr. Stelfox to remain in office until his successor is appointed. It was also agreed to recommend the Council to grant him a superannuation allowance.

Masonic.

At the meeting of the Evening Star Lodge, No. 1719, held at the Gaiety Restaurant last Wednesday, Bro. W. T. Dunn (Secretary of the Institution of Gas Engineers) was elected W.M. for next year; and W. Bro. T. H. Martin, of Barnet, was re-appointed Treasurer. The business transacted consisted in the raising of Bro. Charles Clare, and the initiation of Mr. Thomas Glover (Messrs. Thomas Glover and Co., Limited) and Mr. Daniel Irving, of Bristol. The joining members elected at the meeting were Mr. Maurice Graham and Mr. B. F. Browne, of Buenos Ayres—son of Mr. A. F. Browne, of Vauxhall. At the meeting of the Northern Star Lodge, No. 5053, on Friday, Bro. William Prince, of Stoke-on-Trent, was elected W.M. for 1907.

Accounts of Water Undertakings.

It will be seen from an announcement in another part of the "JOURNAL" that the analysis of water undertakings annually compiled by Messrs. Wood, Drew, and Co., of Gracechurch Street, is now ready. This is the twenty-sixth year of publication of the book, the contents of which have of late been extended and modified, owing to the desire of the compilers to enhance the value of their work by the inclusion of financial and other particulars relating to the water supply of some of the principal towns in the kingdom, and also to the transfer of the undertakings of the London Water Companies to the Metropolitan Water Board. The present edition consists of tabulated statistics of the supply of water in the Metropolis for the year ended Dec. 31, 1905, and March 31, 1906, uniform in arrangement with those of the twenty-five preceding years; and a table is added showing the consideration paid for the undertakings, and the interest charge thereon per million and per thousand gallons of water supplied. Unfortunately, the compilers are not in a position to furnish any figures in relation to the accounts of the Water Board; but they hope to be able to include an analysis in the next edition. The number of Provincial water undertakings the accounts of which are dealt with is twenty-four, or three more than last year—the new places being Bury, Croydon, and Leeds. The tabulated statistics in regard to the supply of water, the working expenses, the profit, loan charges, and surplus or deficiency, and the rates charged in the group of towns selected, occupy fourteen pages, and they are accompanied by explanatory foot-notes.

THE FINANCING OF TECHNICAL RESEARCH.

THE controversy in our columns respecting the financing of technical research in the gas industry induced us to suggest to Herr E. Körting, the Chief Engineer of the Berlin works of the Imperial Continental Gas Association, that he should give in our columns, for the benefit of his British colleagues, some information as to how these things are done in Germany. In this precedent nothing is found that assists the critics of the Council of the Institution of Gas Engineers. We give Herr Körting's communication, with the enclosures.

You mentioned to me the other day that it might be welcome information to readers of the "JOURNAL," if it were briefly explained to them how the German Institution of Gas and Water Engineers collect the means to provide for the various forms of technical and scientific research which are being carried out under their auspices. I am only too glad to comply with your suggestions, and to offer some remarks on the subject.

The research work of the German Institution, the value of which is generally acknowledged, may be classified under three different heads.

1. Scientific research, under Dr. Bunte's personal control, in the laboratory of the "Grossherzoglich Badische Technische Hochschule" at Carlsruhe. This work is an evolution consequent on Dr. Bunte's unique position—combining as this does the Secretary of the Institution, the Editor of the "Journal für Gasbeleuchtung," with the man of science and the teacher of future generations of gas engineers.

2. The research work of the members of the Institution themselves is regulated in such a way that, for every question of general interest which may arise, a Committee is appointed, composed of gentlemen who are supposed to have special experience or ability in reference to the matter in hand. These Committees fully discuss their tasks, make (if necessary) extensive trials and experiments, and publish very full reports of their doings. I am forwarding you, as an example, the report of the Heating Committee, on the suitability of gas-coke for central heating plants.*

3. The trial gas-works for research and training purposes. This works is being erected on the grounds of the Municipal Gas-Works of Carlsruhe, and is to be managed by Dr. Bunte and his staff—products and residuals being made use of by the Municipal works.

I beg to add a list of the various credits granted by the Institution for next year—

1. Dr. Bunte's researches	£150	
Gas Statistics	150	
Water Statistics	150	
		£450
2. Committee on Photometry	£45	
,, ,, Gas-Meters	50	
,, ,, Heating	100	
,, ,, Wandering Electrical Currents (Electrolysis)	300	
,, ,, Standards	5	
,, ,, Standardization of Gasholders	10	
,, ,, Technical Education	75	
,, ,, Water-Works Methods	75	
,, ,, German Technical Museum	50	
		710
		£1160
3. Erection of the trial gas-works (say)		3500
Working expenses of trial gas-works at least per annum		500

Besides the entrance fees, ordinary subscriptions, and the interest on the capital—amounting altogether to about £1000 per annum, and which suffices to meet the current expenses of administration—the Institution possesses the following means for meeting the aforementioned requirements.

1. Sixty-four corporations and gas and water companies have bound themselves to pay extraordinary yearly contributions for scientific purposes. The Directors of the Imperial Continental Gas Association, for instance, have granted a sum of £125 per annum for their five German-speaking stations. The total amount per year under this head is £625.

2. According to the terms of the contract between the Institution and the "Journal für Gasbeleuchtung," the Publisher binds himself to pay a yearly contribution towards the funds of the Institution of £500.

3. The trial gas-works, being a means for research of a new and far more expensive character, has necessitated the collecting of fresh resources. The Institution appealed therefore to the generosity of their members in a circular letter, which fully explained the situation, and of which I forward a copy, in case you should wish a translation made for the benefit of your readers. [See translation.]

This letter has had the effect that up to now 157 members have promised £1800, of which sum about half is to be a payment once for all, and the other half a continuing yearly contribution.

* An abstract of this report was given in the "JOURNAL" for July 24 last, p. 232.—ED. J. G. L.

So far, only the actual members have been asked, although some of the industrial undertakings connected with gas have sent in fair contributions on their own account—as, for instance, the Coal Syndicate. It is, however, intended to approach the associates—viz., the various large industries which owe their prosperity to gas and water.

If the total should still be insufficient to cover the initial cost of the trial gas-works, the deficit will be made good from the available capital of the Institution, which is about £4500.

[TRANSLATION.]

German Association of Gas and Water Engineers.

Berlin, November, 1904.

To the Managers of the Municipal

Gas-Works at . . . .

Contributions to the Association for the Purposes of Technical Research.

During the past twenty years, many of the larger municipal gas undertakings and gas companies have made special contributions to our Association for the furtherance of technical research; and this generosity of a comparatively small number of our members has largely enabled us to bring to a successful issue the investigations we have carried out in the interests of the gas and water industries.

With perfect justice, however, it has been recently pointed out that such a method of obtaining funds is hardly consonant with the general benefits derived from the work done; for the technical researches, and the publications of the Association, are of assistance not merely to those who have provided the money required, but to the gas and water industries at large.

Inasmuch as the problems brought before the Association have become year by year of greater complexity, and their elucidation has consequently become increasingly expensive, the Council have decided to approach the authorities of those gas and water undertakings which have not yet offered us any special contributions with the following request: That they should also take part in providing the funds needed for the technical investigations carried out by the Association, handing us a yearly subscription in proportion to the size and the financial position of the undertaking they represent.

The local authorities and the companies who have hitherto been voluntarily contributing to our research funds, have themselves assessed the amounts they paid; and the relationship between their annual makes of gas and their special contributions has worked out thus—

Above 700 million feet per annum	£25
Between 350 and 700 millions	£10 to £15
,, 100 ,, 350 ,,	£5
,, 35 ,, 100 ,,	£2 10s.

In view of the many expenses of all kinds that gas-works have to meet, an additional annual subscription calculated on the above basis—such as we are asking from you and from other undertakings—cannot be considered a heavy tax, even by a small gas-works. The compulsory insurance against accidents occurring on gas and water works involves an annual outlay of some £37,500, by far the greater portion of which is paid by gas manufacturers. In comparison with this sum, how modest is the amount that has hitherto been at the disposal of our Association for any technical purposes!

The instructional and experimental gas-works which the Association has decided to create, will prove the most important agent in our practical work and future technical investigations. The erection of the gas-works has been rendered possible by an appropriation of £3500 from the funds of the Association; but our current receipts are not sufficient to provide the annual sum of about £500 which will be required for its maintenance.

We take the liberty of calling your attention to the enclosed circular, wherein you will find set forth the objects that we had in view when it was decided to erect the instructional and experimental gas-works, and the manner in which it is to be conducted. You will see from it that the proposed institution is of the utmost importance in the technical development of the entire gas industry, and that the municipal owners of gas undertakings may confidently expect from the experimental gas-works further benefits over and above those they have already received from the labours of the Association. As instances of these benefits, we may remind you of our elaboration of regenerative retort-firing; of our investigations into coke-ovens; of our successful oral and printed advocacy of cooking and warming by gas; of the exhaustive statistics relating to the water supply undertakings throughout the German Empire; and many other things.

For nearly fifty years our Association has been in the forefront of every technical or financial advance made by the German gas industry; and the creation of our instructional and experimental gas-works will confer upon us increased powers to retain that position. But the experimental gas-works will only be of advantage to us if its pecuniary demands are fully met.

We therefore ask you to receive our present application in a favourable manner, and to signify to the General Secretary of

our Association at your earliest convenience what annual subscription we may hope to be given by your proprietors.

Signed, on behalf of the Council of the German Association of Gas and Water Engineers,

Dr. H. BUNTE, Karlsruhe, General Secretary of the Association.
W. W. DRORY, Frankfort-on-Main, Director of the Imperial Continental Gas Association.
L. KÖRTING, Director of the Hanover Gas-Works.
F. REESE, Director of the Municipal Water-Works at Dortmund.

Signed, on behalf of the Instruction and Experimental Gas-Works Committee,

Dr. W. LEYBOLD, Director of the Hamburg Gas-Works.
Dr. W. von OECHELHAEUSER, General Director of the German Continental Gas Company, Dessau.
F. REICHARD, Town Surveyor, Karlsruhe.
G. WUNDER, Town Councillor, Leipzig.

THE INSTRUCTIONAL AND EXPERIMENTAL GAS-WORKS OF THE GERMAN ASSOCIATION OF GAS AND WATER ENGINEERS.

At the Annual Meeting of the above Association, held in Hanover on June 24, 1904, the following resolutions were moved by the President and Council, and were duly carried.

(1) That the Association is prepared to erect and maintain an experimental carbonizing station at Karlsruhe, on a piece of ground in the neighbourhood of Gas-Works No. 2, which has been placed at its disposal by the Municipality; and that the Chemico-Technical Testing and Research Department of the Technical High School be invited to join with the Association in the technical direction and management of the station.

(2) That the Association is prepared to pay a capital sum of not exceeding £3500 for the building and fitting up of the station, as soon as the annual expenses of maintenance, which are not to exceed £500, can be provided—the latter sum to come principally from additional voluntary subscriptions.

(3) That a Special Committee be appointed to supervise the experimental gas-works—such Committee to include the President of the Association and at least five other members, among whom shall be the Technical Director of the Municipal Gas-Works at Karlsruhe, and the President of the Chemico-Technical Institute of the Technical High School.

(4) That the Special Committee be given the task of soliciting voluntary subscriptions towards the expenses of the experimental gas-works from gas companies and other interested parties.

(5) That the General Secretary of the Association be requested to prepare the detailed plans and estimates for the building, fitting up, and maintaining of the experimental gas-works, and that he lay them before the Association; that he also take the necessary steps to secure the co-operation of the Technical High School and the Municipal Authorities in the foundation of the experimental gas-works.

The arguments used by the President and Council of the Association when introducing these resolutions were as follows.

At the meeting of the Association held at Zurich in 1903, a resolution (moved by Herr Wunder) was adopted, to the effect that the comparative commercial value of different gas coals was a subject which should be studied by the Association, and that the Association ought, therefore, to take the steps requisite for the due carrying out of such investigation. As was pointed out in the original papers presented by Herr Wunder and Dr. Bunte (his colleague in the matter), the erection of an experimental gas-works, and its operation under expert control, was the chief requirement for a study of the commercial values of different gas coals.

Seeing that the cogency of these arguments was admitted by the Association, and that the resolution moved by Herr Wunder was passed unanimously, there is no need to lay further stress upon the great impetus that would be given to the entire gas industry—in scientific, commercial, and technical directions—by the existence of an experimental carbonizing works. We may, however, remind our members that a scheme for the erection of such an experimental works was almost completely elaborated more than thirty years ago, and that it only fell through owing to the unfavourable conditions then prevailing. Since that time a considerable number of Technical Associations have come to see that technical and commercial progress is best assured by the conjunction of practical experience with scientific research; and they have consequently founded experimental institutions—often spending large sums of money in so doing. As examples, we may instance the brewers' research laboratories, the scientific institute for the study of fermentation processes, the large experimental establishments of the sugar, cement, metal, and ammunition industries, &c., which have been voluntarily erected by the several Associations, and have been recognized for years as prolific in benefits to the industries concerned.

Although most of these institutes for technical research are autonomous and unconnected with any factory, the peculiar circumstances of gas manufacture point to the desirability of attaching the proposed experimental carbonizing station to some large gas-works, in order that the main and subsidiary products may be employed usefully, and even, if possible, profitably. Such attachment to an existing works not only secures economy in operation, and renders supervision more easy, but it keeps the experimental station in constant touch with actual practice. On the other hand, it is indispensable that the researches should be conducted on strictly scientific lines, if trustworthy methods of valuing raw materials and intermediate products are to be worked out thoroughly, and if the influence of varying conditions upon the technical and commercial results of carbonizing processes is to be properly studied.

For these reasons, it appears as necessary that an experimental carbonizing station founded by our Association should be in immediate contact with a Scientific Institute, as that it should be in constant touch with actual gas manufacture. Hence it is peculiarly fortunate that the management of the Municipal Gas-Works at Karlsruhe, and the officials at the head of the Chemico-Technical Testing and Research Department of the Technical High School in the same city, have shown themselves favourably disposed to the erection of an experimental gas-works, and have most willingly offered to assist in the enterprise. In consequence, a provisional programme and estimate of the cost involved have been drawn up, without prejudice to the future discussion and settlement of questions that may arise; the main features of the provisional scheme being indicated in the resolutions quoted above.

As regards the suggested experimental gas-works itself, the following description may be given: It is proposed to erect, on the piece of ground offered by the Municipality of Karlsruhe, in the vicinity of Gas-Works No. 2, a building to contain a setting of two retorts (or perhaps two settings) with the plant belonging thereto, a laboratory provided with all necessary chemical and physical apparatus, a photometer room, and the requisite minor apartments. A holder capable of storing 71,000 cubic feet of gas will be built. Pipes will be laid so that, for the purposes of special experiments, gas can be led directly from the retorts of the adjacent large gas-works to the experimental station. In this manner, it will be possible to carry out a systematic examination of the gas-making values of different fuels—principally coals—and also to study many important questions that occur in the regular manufacture of gas and in the employment of various kinds of plant. The laboratory is to be fitted with appliances for exhaustive investigations of all descriptions into processes of carbonization for testing the value of gas as an illuminating and heating agent, and for appraising the efficiency of apparatus—such as burners, lamps, stoves, &c.—intended for the consumption of gas.

Through its connection with the Chemico-Technical Institute of the Technical High-School, the experimental gas-works is to be employed for purposes of instruction. In addition to the holiday courses for gas engineers, lessons will be given in the practical aspect of works management, as well as in the processes of making, purifying, and consuming gas. The contact that is to be maintained between the experimental gas-works and the Technical High School will ensure its being always in touch with scientific advances, will provide it with teachers alive to the scientific and practical objects of the work undertaken, and will assist in the provision of a constant supply of well-trained hands for the gas-works.

The estimates already given for the expenses of building, fitting-up, controlling, and maintaining the experimental station have been drawn up in consultation with the technical officials of the Municipal Gas-Works at Karlsruhe, to whose assistance we are much indebted.

Now that by the appearance of our Society upon the "Public Register of Associations" we have acquired the rights of a corporate body, and are enabled to perform judicial functions, one of the best methods of employing part of the rights and privileges we have recently acquired must assuredly be the foundation of an "Institute for Research," inasmuch as the existence of an experimental gas-works cannot but prove of extraordinary value in technical as well as commercial directions to our Association and to the industries it represents.

ELECTRIC LIGHTING MEMORANDA.

The Oxford Street Lighting—Centralization of Lamp Standards in Roadways—Rates and Electricity Prices in Marylebone – Municipal Supervision over Company Accounts – Depreciation, Public Lighting Charges, &c.—Municipal Trading on Four per Cent. Money.

THE Marylebone Borough Council appear to be pleasing no one over their unique scheme for the lighting of Oxford Street. They first upset the economy-with-efficiency party within their own membership by throwing overboard the original recommendation of one of their Committees that the improvement of the lighting of the street should be by the efficient and cheap system of incandescent gas lighting, and by following this with the adoption of a system of flame arc lighting on a plan that merited, and has received, the ridicule of men practically acquainted with the requirements of streets in the matter of artificial illumination. When cable-laying commenced, the West-end grumbled at the nuisance, and an Electric Light Company complained of trespass on their territory in connection with certain of the side lamps; when the erection of the electric lamp standards commenced, the susceptibilities of an artistic gentleman were wounded, and he aired his grievance in "The Times;" and now the Highways Committee of the London County Council are complaining of the erection of the lamp standards on refuges in the centre of the road as being an impediment to road traffic. This objection to the situation of the lamps goes to the very root of the means whereby the Electricity Department are striving to bring the running costs of the lighting of Oxford Street by flame arcs as near as possible—without taking account of the initial expenditure chargeable to the ratepayers for realizing the end—to the costs at which the Gaslight and Coke Company offered to do the lighting. We do not like central lamp-posts, excepting on those refuges that are absolutely necessary at crossings for the convenience and safety of pedestrians; and that is an objection that we have to the lighting of Kingsway. The report presented to the County Council last Monday indicates more than anything that has been published before the grotesqueness of this scheme for dealing with the lighting of Oxford Street. It will be remembered that on some of these central standards two flame arcs are to be suspended, and on others one. This alone ensures patchy lighting effects. But now

we learn that between the Marble Arch and Tottenham Court Road, the standards are to be on refuges at distances varying from as low as 20 yards to as high as 160 yards apart. How is it possible to get any uniformity of effect under such a plan of column location? If the Borough Council do not at once put an end to this absurdity, they cannot be held blameless later on. We foresee, if it is persisted in, the erection of compensating lamps, which will carry the cost for the lighting far and away beyond the original estimate.

It is not, however, on this particular aspect of the question that the Highways Committee of the County Council take exception to the construction of the central refuges and standards. Their interest lies in the direction of securing free and rapid locomotion; and they object to the monopolization of the centres of roadways in the manner indicated. To support them in the position taken up, and the protest they have issued, they have the emphatic declaration of the Royal Commission on London Traffic, "that no fixed obstacle to traffic in future should be allowed to be placed in any street without the approval of the proposed Traffic Board." The advisability is to be considered of the Council promoting legislation in the session of 1908 to confer powers upon them to deal with cases of obstruction to traffic by the erection of obstacles in the carriage-way. Opinions alter with the changing circumstances of time. When arc lighting was struggling for introduction, gas-lamps for street lighting were roundly abused by the champions of electricity for their frequency on the footways. Then came the heavy, unsightly, and space-occupying columns of the arc lamps. Following this, in the cause of electricity, the tremendous columns inseparable from the trolley-wire system of tramway traction were introduced. And then, to save expense, the central standards to be used for arc lighting. Who now are the transgressors?

While mentioning this matter of the lighting of Oxford Street —incandescent gas lighting having been rejected so that the business should not be lost to the Marylebone Electric Lighting Department—it is not out of place to refer to the fact that complaints are being made in the borough as to the heaviness of the rates. It is, however, denied that the electricity undertaking, notwithstanding its gigantic capital, imposes any charge on the rates. Perhaps it does not do so directly or openly; but there is no knowing how soon it will have to do so. It has been announced, however, by the Town Clerk that, should there be a deficit on the working of the undertaking, it will be met by an increased price for current. That is a noble resolve; and a sound business principle. But the free application of the principle, with a concern so heavily capitalized, suggests trouble. Increasing prices so as to meet deficits cannot go on *ad infinitum*. An increase in prices, with the obsession of competition, would be bound to result in a certain loss of custom; and loss of custom means loss of profit. And the capital and standing charges on this undertaking will not permit of this kind of thing. Therefore, notwithstanding the stout declaration of the Town Clerk, and having regard to the last accounts of the department, we are still doubtful as to the future immunity of the ratepayers from the burden of loss. The undertaking is not one of those that the London County Council are aspiring to acquire under their electricity scheme, which, by the way, there are rumours of intention to curtail in view of the rout of the Progressives at the recent Borough Council elections. Be that as it may, the Town Clerk of Marylebone intimates that the transference of the borough's electricity undertaking to the County Council "on equitable terms" would not perhaps be unfavourably regarded by the inhabitants. Of that, there cannot be the slightest doubt; but "equitable terms" would, under the depressing circumstances of the Marylebone concern, be the rock on which any overtures from the one side or the other would eventually be wrecked.

It is highly amusing to watch the efforts of the Local Authorities to bring the London Electric Lighting Companies to book over their accounts. Of course, it is a poor form of retaliation for the perpetual and well-grounded attacks that are made on the accountancy of municipal authorities. The demand for greater supervision beyond that afforded by the Public Auditor, and for power to enforce the objections of that official, is advanced on the right of purchase, at specified periods, conferred upon local authorities under the Electric Lighting Acts. Dr. Macnamara has raised the question twice in the House of Commons; and, from the replies given by the President of the Board of Trade, it appears that there is not much fault to find with the present arrangements—seeing that "generally the requirements of the Auditor are met by the Company; but in any case where they are not met, it is the practice of the department to communicate to the London County Council and the local authority (the bodies concerned in the questions of revision of prices and purchase of the undertaking), a copy of the accounts, and of the Auditor's report, and of any correspondence relating thereto." But if a satisfactory arrangement can be effected, Mr. Lloyd-George says he is quite prepared to consider the question of making regulations in regard to facilities being granted to discuss with the Auditors of the accounts of the Companies any questions which may arise on them. It is asserted that charges are made by certain Companies to capital which should go to revenue, and that insufficient provision is made for depreciation, which are not unknown as weaknesses in connection with the electricity accounts of municipal authorities; and we have yet to learn in whom the power is vested to compel municipalities to do the correct thing in these respects. Reference to depreciation reminds us that, even among the officials of the Local Government Board, opinions are not in unison. At Salford, one of the Inspectors (Mr. M. K. North) was the other day urging the importance of a strong depreciation fund; at Southwark the very same day, Mr. Carson Roberts one of the Auditors of the Board was saying that, "although there is no fund called a depreciation fund, it is absurd to say no fund of the kind exists. The electricity undertaking by the repayment of principal has what is much larger—a sinking fund, which is a depreciation fund *plus* something else." Mr. Carson Roberts is a man of figures; and not a technician. He has something yet to learn from those authorities who have found renewal or depreciation funds invaluable in connection with electricity plant. Supposing his studies start with Bradford. But on the main question, the London County Council have been advised to address a communication to the Board of Trade in support of the proposal that facilities be given to local authorities invested, under the Electric Lighting Acts, with powers of purchase, to discuss with Official Auditors questions arising on the accounts, and asking the Board to again give consideration to the suggestion that authority be sought from Parliament to enforce any objections raised to the accounts by the Auditors.

Of course, it may be argued that what is "sauce for the goose is sauce for the gander." Electric lighting companies, as large ratepayers, have the right to appear before the Auditors appointed by the Local Government Board in connection with the accounts of public authorities. The difference, however, is that municipalities trade with public money; companies with private money, losses on which do not affect the ratepayers. The Electric Supply Corporation, Limited, who are competitors of the Bermondsey Borough Council's electric supply undertaking, have taken advantage of the power in the case of the accounts of that concern. It will be remembered that Mr. R. Stewart Bain, the Managing-Director of the Supply Corporation, has twice this year made strong representations to the Local Government Board regarding the manner in which the accounts of Southwark and Bermondsey are kept; and it was this Corporation, too, who offered to do the electric lighting of the streets now illuminated by that means at a cheaper rate than the borough authorities are charging themselves. The Corporation were represented by Counsel before the Auditor, in support of their assertion that the accounts were erroneously stated, and that charges were made against the general rate account, with the result that, instead of showing a loss, a *primâ facie* profit was presented. We have referred to these charges before; and so will not traverse them again, but confine ourselves to a couple of points. The offer made by the Corporation for the supply of electricity to the public lamps was at 1½d. per unit; while the Bermondsey Borough Council were at the time charging themselves 2¼d. They have now, it is asserted, reduced this to 1¾d. But an absurd feature of this is that the Council are supplying the Surrey Commercial Docks at 1d.; and their own ratepayers at 1¾d. The County of London Company have expressed their willingness to supply the public lamps at 1¼d. per unit; and now the Electric Supply Corporation say they will, if the lighting is put up to competition, supply—and right up to the lamps themselves—at 1d. per unit. Here is the Council's opportunity for obtainining an advantage for the ratepayers. Another allegation is that the Council are not charging the electricity undertaking by some £3000 per annum for steam supplied by the dust-destructor. Then, again, the Council do not put by anything for depreciation. The Company are compelled to set aside 1·71 per cent. on its capital outlay; if the Council did this, £2100 would have to be charged against the year's accounts. On this occasion, Mr. Carson Roberts once more trotted out the old fallacy about the sinking fund covering more than depreciation; but electrical engineers know full well that loans are frequently not liquidated at the time the subject is worn out, or has arrived at an uneconomical condition. The accusations of the Corporation are to be further investigated. What they are doing in this matter is only an incident in the battle that private enterprise throughout the country is giving to municipal trading; but it is interesting in that the competitors in conflict deal in the same commodity. The Borough Treasurer has written to the press to say "the present moment is inopportune for dealing more fully with the scandalous charges," but a complete answer will be issued after the inquiry.

The Woolwich Borough Council have had a sharp reprimand from their bankers. The Borough Treasurer had been duly instructed to arrange an overdraft amounting to £60,000, of which £41,739 was on electricity account. The bankers' reply was that they would only agree to meet the convenience of the Council on the condition that the interest was raised from 3 to 4 per cent. Municipal trading on borrowed money at 4 per cent. will be found rather heavy work. It is asserted that, apart from the losses on trading, if the electricity undertaking were sold to-morrow at its market value, it would not pay back the capital. This dismal financial condition has been produced by the extravagance of the old Progressive Labour Council. It is not a comfortable inheritance that the new Council enter upon. But the time cannot surely be far distant when Parliament will be forced, by the insistence of the electors, to seriously deal with this question of municipal trading by irresponsible men, who are in office one day and out the next, leaving behind them a terrible accumulation of muddle and liability for others to wrestle with.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 696.)

Last week opened on the Stock Exchange in a rather uncertain mood; and it seemed as if apprehension in regard to the monetary outlook was going to choke both speculative enterprise and solid investment. Then a heavy account was expected, with the attendant chances of difficulty over the settlement; and fresh business was kept at low pressure. Gradually, an improvement set in. The account proved lighter and easier than had been foreboded (there was only one small failure); and money looked brighter. From this point, the rally was steadily pushed forward. The gilt-edged division, headed by Consols, advanced with the support of buyers, and the more speculative lines were lively and buoyant; so that prices at the close were about the best of the week. The Money Market showed a rather undecided tone at first—backward and forward movements about balancing each other. There was a strong demand for the Stock Exchange and the month-end requirements. But, when these had been met, the condition became more and more easy; so that even those who had been shivering at the thought of a 7 per cent. Bank Rate began talking of the chances of a reduction this week. The volume of business in the Gas Market showed a great falling off, and there was a dullish feeling—jobbers showing no disposition to carry much stock. Nevertheless there was no marked sign of weakness; and though a few issues had a slight set-back, these were fully counterbalanced numerically by the advances made by others. In Gaslight and Coke issues, the ordinary was very lightly dealt in—sometimes at the rate of one bargain per diem—and prices were fractionally easier than in the preceding week. The figures ranged from 98¼ to 99; and the quotation was lowered half-a-point. The secured issues were stronger. The maximum changed hands at from 89 to 90; the preference at 108⅞ and 109 —an advance of 1; and the debenture at from 85¾ to 87—a similar advance. South Metropolitan was much neglected; there being only one bargain in the ordinary at 128, and one in the debenture at 86½. Commercials were very quiet; and an offer of some 3½ per cent. brought the price down to 108. The debenture was done at 84¼. The Suburban and Provincial group were very inactive. Brentford old marked 262½; Brighton original, 230; Bournemouth "B," 17⅛ and 17⅜; Tottenham "B," 106 and 104½ special; and ditto debenture, 103. The Continental Companies were as inactive as the rest. Imperial was done at from 180 special to 181½—a fall of ⅛; Union, at 129—a rise of 1; and European fully-paid, at 24⅝. Among the undertakings of the remoter world, Buenos Ayres marked 11⅞; Primitiva ordinary, 7 7/16 and 7½—a fall of ¼; ditto preference, 5 3/16; ditto debenture, 97¼ and 97⅜ *cum div.*; Monte Video, 11⅛—a rise of ½; San Paulo, 13¾; Melbourne 5 per cent., 101¼; and Oriental, 155½. On *ex div.* adjustment, Oriental rose 2½.

The closing prices are shown in our Stock and Share List on page 696.

STRENGTH OF THE GAS INDUSTRY.

The Financial and Commercial Supplement to "The Times" yesterday contained an interesting article on the above subject from a correspondent. The writer began by remarking that threatened industries, like men, live long, and gather fresh vitality from the strenuous struggle for existence; and he pointed out that, in spite of all that electricity has threatened and performed, "there is hardly an important industry which has made greater progress during the past decade than has that of gas production." He went on to show how the gas-stove, the gas-engine, the incandescent mantle, and the introduction of the prepayment system, have revolutionized the gas industry; the last-named innovation having resulted in a large extension of business among the poorer classes, and been no small factor in establishing the gas companies in their present strong position. Special attention was directed by the writer to the merits of the inverted incandescent burner and of high-pressure gas lighting; and he suggested that the burner, both for its efficiency and artistic effect, will probably be "the domestic gas-light of the future," while the high-pressure lamp, cheapening as it does the candle power by 50 per cent., will be "the most popular means of lighting large areas, both outdoors and indoors." The writer next dealt with the relative cost of gas and electricity, and gave the following comparative figures:—

—	Electricity.		Gas.	
	Price per Unit.	Work obtained from One Penny.	Price per 1000 Cubic Feet.	Work obtained from One Penny.
Street lighting	..	425 candle-hours	..	740 candle-hours
Domestic lighting	4d.	72 "	2s. 6d.	572 "
Heating	1	17 pints of water boiled	2 6	44 pints of water boiled
Power	1	1⅓ H.P. per hour	2 0	2½ H.P. per hour

He explained that the figures for street lighting had been taken from the tenders submitted by the Metropolitan and Charing Cross Electrical Companies and the Gaslight and Coke Company for the lighting of Kingsway and Aldwych; and that the others were based on the results of investigations "by the leading authorities on gas and electricity." Commenting on the figures, the writer said:

> The table illustrates in a most conclusive manner that, in regard to cheapness, electricity is at present very far behind, so much so that not only is gas now adopted in nearly every case in which the two rivals meet in open competition, but it has also displaced in many cases existing electric lamps, notably in the streets of the City of London. One gas company reports that they have entirely displaced electricity in nearly a thousand cases during the past two or three years, and that in more than a thousand other cases electricity has been largely superseded by gas.

The writer next considered the attitude of investors in regard to the two industries under comparison, as shown by the general tendency of the market quotations during the past few years. "Three years ago," he said, "the public had not grasped the situation—a fact which has now been forced on them by the reductions in the dividends of several of the most prominent electrical companies. He gave some figures to show the great difference in the yields obtainable from an investment in the two groups of undertakings, and said it emphasized the opinion held by the public that "electrical shares are of the two the more speculative." The writer thought that too much should not be made of the figures; but he said they at least established the fact that, while there has been a general fall in electrical securities, a substantial rise has taken place in gas stocks. No less than four of the Electrical Companies have been compelled to reduce their dividends during the period mentioned; whereas four of the Gas Companies have been able to increase theirs.

After a few remarks on the sliding-scale system and the introduction of profit-sharing, the writer reviewed briefly the efforts made in recent years in the direction of cheapening production of gas, with the view of reducing the price—first to meet competition, and secondly to allow of the declaration of increased dividends. In this connection, reference was made to the repeal of the sulphur clauses, whereby the companies are enabled to employ "a far more economical method of purification, and one which will be the source of considerable saving." Stress was laid upon the fact that under the sliding-scale more than "80 per cent. of any saving effected in the cost of production goes to the consumer;" so that the gas companies cannot, unlike many other public companies, "be accused of benefiting themselves and their shareholders at the expense of the public."

The writer concluded with a few remarks on the residual products of gas manufacture. He pointed out that, whereas a year ago large quantities of coke were sold at about 10s. per ton, the price is now some 3s. or 4s. higher, which counterbalances a rise of 9d. to 1s. per ton in the price of coal; while the outlook for tar is "very hopeful," in view of its utilization for road surfaces.

SUCCESS OF THE ILFORD GAS COMPANY.

It is with much satisfaction that we record, in our "Legal Intelligence" columns to-day, the successful defence made by the Ilford Gas Company in the two last claims that have been so unwisely and rashly brought against them. It will be remembered that a series of actions has arisen in connection with damage alleged to have been caused by them to certain house property, in consequence of the heavy rains and severe flooding which took place in the valley of the River Roding in June, 1903. After so many actions had been fought, all based on the same primary cause, it would be useless to repeat the essential facts which have come out from the litigation. The important thing to note is that, though the legal machinery may grind slowly, justice is done in the end; and no countenance whatever will be given to speculative claims propped up by doubtful and flimsy evidence—or by none at all. The whole series of the claims brought against the Ilford Gas Company has had these unenviable characteristics; and the severe comments of the Official Referees have been the same in all cases. Thus, in the judgments reported to-day, we find the learned Referee, Mr. Verey, describing some claims as being "much exaggerated," "unsupportable," and "made without sufficient care;" while the evidence on some points was "very unsatisfactory."

In Benning's case, the original claim was for about £1115, but was afterwards reduced to £892; and now the plaintiffs have the satisfaction of learning that their real claim ought to have been £83 15s. This is the amount they have been awarded; but as defendants had paid into Court more than this sum, judgment is entered for them with costs from the date of the payment into Court. The same result followed in Roberts's case, in which a sum of £531 was reduced to £30. As the plaintiffs in these cases will have to pay very substantial costs, the danger and penalty of formulating inflated claims may teach a much-needed lesson, and give pause to any other would-be claimants, if such there be.

The other matter for congratulation to the Ilford Gas Company is upon their progress in general, as exemplified in particular by the opening of new and beautiful central offices and showrooms, which were inaugurated by a successful dinner to the

staff last Thursday. A short account of this event is given in another column. Here we would only add our commendation of the growing practice of gas companies putting up attractive buildings in busy centres (as is done by banking and insurance companies), so as to show their wares to the public to the best advantage. No opportunity nowadays should be missed of making the public see what are the latest and best means of consuming gas, and of bringing to their notice the many artistic fittings which are now available.

In offering our hearty congratulations to the Chairman and Directors, Engineer, and Secretary of the Ilford Gas Company, upon both their legal victory and technical progress, we trust we shall see the expansiveness of the interesting figures given by Mr. William Ashmole long and increasingly continue.

GAS LIGHTING UNDER DIFFICULTIES IN RUSSIA.

[COMMUNICATED.]

THE course of events in Russia continues to provide anxious moments and thrilling experience for foreigners associated with gas-works owned by companies not of native origin. A case in point exists at Warsaw, where the gas-works are the property of the German Continental Gas Company of Dessau. According to a Warsaw communication of the 22nd ult., the murder of the Manager of the local gas-works (Adolf Welke) and the continued fermentation among the workmen caused the Dessau Company to ask the Warsaw authorities for military to guard all the establishments. The local management, it is declared, were opposed to the proposal; but their opinion was overruled. Thereupon the Warsaw engineers, mostly Germans, handed in their resignations; and only the President of the Company, who had arrived from Dessau, adhered to the requisition for a military guard. The engineers then left the works, and one of them (Herr Lindstedt) set out on the return journey to Germany. On the evening of the 21st ult., the General Director (Herr Otto Alberti) was arrested at his residence by order of the Governor. Engineer Lange was waited upon by soldiers with the order to assume at once the position of Director, and to betake himself immediately to the gas-works, whither he was accompanied by the soldiers. Two days later, according to a second despatch from Warsaw, Herr Alberti was released from custody.

A little light on the foregoing incidents was thrown on the 30th ult., when an intimation was issued, both in Berlin and at Frankfort-on-the-Main, apparently on behalf of the Dessau Company, to the effect that at no time has any difference arisen between the Central Administration at Dessau and the local management at Warsaw. The departure of Herr Lindstedt from Warsaw is stated to have taken place in complete agreement with his principals, and to have been solely due to the overstraining of his nerves which has been brought about by the work in recent years. After repeated attempts to murder the principal officials of the Company, and as they were exposed to daily threats by the workmen to take away their lives, the Central Administration at Dessau asked the General Governor at Warsaw for protection for the officials, as otherwise the Company would be compelled to decline any responsibility for the continued operation of the gas-works. It was upon this representation that the military authorities, as was the case last year, occupied the works, which are partly carried on by soldiers, and partly by the Company's own workmen. This apparently inspired communication adds that the arrests and suspensions came as a surprise to the Company, and they are regarded as having been effected so as to ensure the life of the officials and the maintenance of working operations. It is expected that the disturbances at Warsaw will have the effect of causing the dividend of the German Continental Gas Company to drop from 10 per cent. paid in 1905 to 8 per cent. for the past year, owing to the continued decline in gas consumption.

The Directors of the New Gas Company of Berlin, who are also interested in gas-works at Wilna and Cronstadt, state that the local events in these towns have caused the works to suffer. In addition to the demolition of nearly all the street-lamps at Cronstadt during a revolt, the rioters destroyed a quantity of the Company's property. On the other hand, there have been repeated strikes and long interruptions in working in connection with both the Russian stations during 1905-6. These incidents rendered it necessary to employ unskilled labour and to pay higher wages and undertake more frequent repairs; and the financial results have consequently been largely prejudiced. Since the beginning of the current financial year (1906-7), the work at Wilna and Cronstadt has been continued without interruption; and the opinion now prevails that events are assuming a quieter course, and returning to normal conditions.

Manchester and District Junior Gas Association.—By invitation of Mr. T. O. Paterson, M.Inst.C.E., the Gas Engineer and Manager of the Birkenhead Corporation, the members of the Association will visit the gas-works of the Corporation next Saturday.

Yorkshire Junior Gas Association.—Next Saturday, the members of the Association will visit the Dewsbury Gas-Works by permission of Mr. C. A. Craven, Assoc.M.Inst.C.E., the Corporation Gas Engineer and Manager, and will subsequently assemble in the Town Hall, where Mr. G. W. Fligg, the President, will deliver his Inaugural Address.

THE WORLD'S COAL PRODUCTION.

SOME particulars were given in the "JOURNAL" for the 6th ult. (p. 377) with reference to the output of coal in the United Kingdom during the year 1905; and these can now be supplemented with similar information regarding other countries, in consequence of the issue by the Board of Trade of their Annual Statistical Coal Tables, relating to the production, consumption, and imports and exports of coal in the British Empire and the principal foreign countries. Many of the figures quoted, of course, reach huge proportions. For instance, we are told—though it must be pointed out that to a considerable extent the tables are provisional—that the total known coal production of the world (exclusive of brown coal or lignite) during the year 1905 was about 840,000,000 tons, of which the United Kingdom produced rather less than one-third. This figure has not been reached at any previous time; for four of the principal coal-producing countries (the United Kingdom, Germany, France, and the United States) had record outputs last year; while the fifth (Belgium) did not show any very alarming falling off.

The production of the United States (350,821,000 tons) is now nearly 50 per cent. greater than that of the United Kingdom (236,129,000 tons); while Germany (with 119,349,000 tons) is about the same distance behind us. In comparison with these amounts, the outputs of France (34,778,000 tons) and Belgium (21,506,000 tons), substantial as they in reality are, seem to be hardly worth mentioning. While the United Kingdom's increased output in 1905 as compared with 1904 was not quite 4,000,000 tons, that of the United States went up more than 36,000,000 tons. It is, however, remarked by Mr. A. Wilson Fox (who is responsible for the compilation of the statistics) that the figures have a somewhat different appearance when studied from the point of view of production per head of the population, than is the case when the total outputs are considered. The production of coal in the United Kingdom amounts to nearly 5½ tons per head; while in the United States it is rather less than 4¼ tons. In Belgium it amounts to 3 tons per head; in Germany to about 2 tons; and in France to under 1 ton. Prices last year were in this country and America unfavourable when compared with 1904 and 1903. The following are the average values per ton, taken at the collieries, over the period mentioned: United Kingdom—1903, 7s. 8d.; 1904, 7s. 2½d.; and 1905, 6s. 11½d. Germany—1903, 8s. 9d.; 1904, 8s. 8¼d.; and 1905, 8s. 9½d. France—1903, 11s. 5½d.; 1904, 10s. 10½d.; and 1905 (not available). Belgium—1903, 10s. 6¾d.; 1904, 10s. 8d.; and 1905 (not available). United States—1903, 6s. 7d.; 1904, 5s. 10¾d.; and 1905, 5s. 8d. There has thus been a fall in price in this country since 1903 of 8½d. per ton, and in the United States of 11d. per ton. The average value per ton of coal in the United Kingdom last year was less than in any year since 1898; while in the United States it was (with the exception of the years 1903 and 1904) higher than in any previous year since 1898. Any strict comparisons between the different countries are, of course, not possible, because there is coal and coal; and in order to arrive at a really definite conclusion, it would be necessary to consider the qualities of the various outputs.

It is gratifying to see that the same tendency towards increased output is manifested by the British Possessions as by foreign countries. Last year's outputs, although not showing any very striking increase over 1904, were the highest yet recorded for British India (8,425,000 tons), the Australian Commonwealth (7,496,000 tons), New Zealand (1,586,000 tons), Canada (7,836,000 tons), the Transvaal (2,327,000 tons), and Natal (1,129,000 tons); the only decrease being shown by the Cape of Good Hope, whose production is, however, a very trifling one—147,000 tons in 1905, as compared with 154,000 tons in 1904. Nearly the whole of the output of the Australian Commonwealth is produced in New South Wales. In 1904, the output per head of the population was over 1⅞ tons in Australia, about 1¾ tons in New Zealand, and nearly 1½ tons in Canada. Speaking generally, the prices were lower in 1905 than in the preceding twelve months; the average value per ton at the pit's mouth for the past three years being: British India—1903, 3s. 6d.; 1904, 3s. 5d.; 1905, 3s. 5d. Australian Commonwealth—1903, 7s. 4d.; 1904, 6s. 10d.; 1905 (not available). New Zealand—1903, 10s. 9d.; 1904, 10s. 9d.; 1905, 10s. Canada—1903, 9s. 1d.; 1904, 8s. 11d.; 1905, 9s. 3d. Transvaal—1903, 8s. 9d.; 1904, 8s. 3d.; 1905, 7s. 3d. Cape of Good Hope—1903, 19s. 4d.; 1904, 20s.; 1905, 18s. 8d. Natal—1903, 11s. 9d.; 1904, 10s. 8d.; 1905, 8s. 3d.

Perhaps the most interesting portion of the statistics is that which relates to the consumption of coal in various countries, which is arrived at by adding the imports to the home production, and deducting the exports. The provisional figures show that the four largest coal-consuming countries in 1905 were: United States, 343,280,000 tons; United Kingdom, 169,017,000 tons; Germany, 106,715,000 tons; and France, 46,046,000 tons. The total consumption of coal in the United States is thus twice as great now as that in any other country; while the consumption per head of the population also exceeds that experienced anywhere else. The United Kingdom used last year 3·91 tons per head; United States, 4·13 tons; Belgium, 2·75 tons; Germany, 1·77 tons; and France, 1·17 tons. It is pointed out, however, that the small figures for France and Germany are accounted for by the fact that there a large quantity of fuel of other sorts is also in use. The consumption per head in Canada (2·29 tons) is higher than that in any other of the chief British Colonies; New Zealand

coming next with 1·84 tons, and the Transvaal third in order with 1·59 tons. Of the total consumption of the United Kingdom, the United States, and Germany, over 90 per cent. is of native production. In fact, in the case of the United Kingdom, 99·97 per cent. of the consumption is produced at home. Germany last year consumed nearly 7,500,000 tons of British coal—or almost 7 per cent. of her total consumption; but France takes less of our coal year by year—the amount in 1905 being only 5,750,000 tons, as against 7,500,000 tons in 1900—while in the same period her consumption of German coal has increased from 2,000,000 tons to more than 3,000,000 tons. These two countries and Italy are our principal customers; while the exports of coal from the United States are still sent mainly to neighbouring countries—especially Canada. Of the exports of Germany, rather more than half are sent to Austria-Hungary and Holland.

In 1904, the output of lignite was in Germany 47,853,000 tons, in Austria 21,635,000 tons, and in Hungary 5,430,000 tons. The quantity of lignite produced in the United States is included in the figures for the production of coal already given; but in 1904 the output amounted to 5,725,000 tons. In no other country does the quantity produced reach a million tons. The total production of petroleum in the United States in 1905 was 4,095,000,000 gallons, or practically the same as in the preceding year; but the output of the Baku oil-fields of Russia fell from 3,040,000,000 gallons in 1904 to 1,710,000,000 gallons in 1905. The combined production in 1904 of Germany, Austria, Roumania, Japan, Canada, British India, and Java and Sumatra amounted to rather more than 700,000,000 gallons.

THE IRON TRADE AND THE GAS INDUSTRY.

A RECENT issue of the "Journal für Gasbeleuchtung" contains an article calling attention to the peculiar conditions now prevailing in the German iron trade, and the effect they are liable to produce upon the coal-gas industry. The German ironmasters are abnormally busy; and some of them have already accepted commissions which will keep their plant fully employed for several months of the approaching year. They are, therefore, declining to give any guarantee for the completion of their orders by specified dates. This, of course, puts the engineering firms into a position of much difficulty; for the keenness of competition renders it impossible for them to copy the ironmasters in refusing to accept time clauses. In fact, fifteen Swiss engineering concerns have sent a joint circular-letter to their customers, pointing out the great delays experienced in obtaining metal from the rolling mills, and stating that Swiss and German stocks of beams, &c., in the usual sizes are practically exhausted. Hence orders placed for quick delivery cannot be executed satisfactorily, nor can normal prices be maintained, owing to the necessity for working overtime in the shops. The writers, therefore, strongly advise their clients to give out their orders as long as possible before the goods are required.

It may be pointed out that it is customary for the German gas industry to allow a sufficient length of time for the execution of its orders, and the engineering firms which supply it are fully alive to the necessity for the completion of orders within the time specified. In the case of municipal undertakings, however, new orders frequently cannot be given out until the accounts have been audited and the estimates for the forthcoming year agreed to; so that it is often April or even May before the engineers know what new plant is required. Inasmuch as constructional work on a gas factory ought, of course, to be concluded before the winter, the system of terminating the financial year in the spring is held by many to be highly inconvenient, and delays in winding up the accounts become intolerable.

The engineering trade of Germany has had its troubles during the passing year, owing to the repeated strikes of labourers, which have completely disorganized the running of the shops, and made it impossible to keep the fitters properly employed. The Brunswick steam-boiler and gasholder works were shut down for seven weeks some little time ago. On the other hand, the gas industry of Germany has been remarkably busy, and this has aggravated the difficulties of the engineers and the machine builders. A dozen or more large holders, all provided with iron tanks, have been under construction—periods of from six to ten months only being granted for their completion. Several new gas-works of medium size have been built; the time at disposal being comparatively short. Some sixty towns, formerly unprovided with any public lighting supply, have been fitted with gas-works during the year. Renewals and enlargements of, and additions to, new apparatus have been many. The demand for coal and coke conveyors has grown largely; and the tests with vertical retorts at Dessau, our contemporary points out, have thrown much extra work upon the constructural engineering firms. In only a few instances has delivery of the plant or machinery been unduly delayed; but the strain thrown upon the constructors by their efforts to fulfil their contracts, has been extremely severe. The engineering firms are indeed still very busy, and much work which should have been finished this year will remain to be dealt with next spring. It is therefore urged that owners of gas-works should give out their orders for new plant they require as soon as possible—more particularly so because the price of raw materials is rising. Apparatus ordered well in advance of the time when it is needed can be erected without haste in the best period of the year, can be painted and tested properly, and will be more likely to prove efficient when the autumn comes.

NEW LIGHTING AND EXTINGUISHING DEVICE.

CONTRIVANCES for lighting and extinguishing burners, whether for domestic or public gas lighting, have been the subject of vigorous devising during recent years; but there have been comparatively few, for one reason or another—inherent defect, expense, or the want of opportunity for introduction—that have had bestowed on them any considerable amount of favour. Mr. J. E. Burrell, of No. 3, Hestercombe Avenue, Fulham, S.W., has brought to notice an improvement on a lighting and controlling device in which he is interested, and the application of which has been extended to street lighting. The arrangement is an electrical one; and it is compact, strongly made, and has every appearance of a long serviceable life. With electrical devices of the kind, the means by which the various operations are effected, in order to make description comprehensible, must needs be entered into with such detail that we shall not attempt explanation in the space at disposal to-day. Suffice it to say that, with this device, there can be a variety of arrangement so that single lamps, parts of clusters, whole clusters, or series of burners, can be lighted and extinguished at varying times or simultaneously just as desired; and moreover the arrangement is suitable for incandescent or any kind of flat-flame burner. For indoor lighting, a push-button or switch is used.

The improvement in the device enhances its application for the ignition and extinguishing of the burners of street-lamps. There are many engineers who object to devices that demand the use of a bye-pass light—the multiplicity of these jets in a large district representing a fairly considerable consumption of gas over a twelvemonth. In this arrangement, whether used for incandescent or flat-flame burners, no constant consumption of gas is involved. Incorporated within the device there is a coil of pure platinum. The employment in these devices of platinum for lighting purposes has not always been quite successful; but the present inventors give assurance of its success and thorough reliability, and of the platinum coil possessing a great number of years' service. The platinum is not fired by dampness or anything else other than a fine current of gas, which causes it to become dull red and to ignite the flame of the burner.

The operation of the device for street lighting is interesting and novel. No push button is used when the arrangement is applied to street-lanterns. The wires are brought down from the lantern, inside the lamp-column, and end on a hard metal disc affixed to the outside of the column. The lamplighter carries a corresponding disc, with a small dry cell. The instant he touches the disc with the one in his possession, the gas is electrically turned on and ignited by the heated platinum. On repeating the application of the disc, the action of the arrangement is reversed, and the light is extinguished. The lamps can be fitted up in series, so as to be operated—each series—from one point. The cost of producing the device has been reduced; and this is, next in importance to reliability and durability, a consideration to lighting engineers contemplating the installation of such a system.

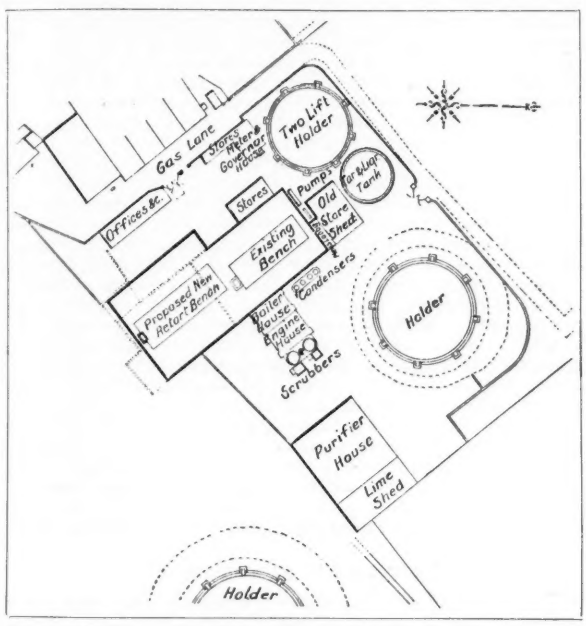
The Report of the Manchester Institution Meeting.—In the report of the discussion on Mr. Stevenson's paper at the meeting of the Manchester Institution which appeared in the "JOURNAL" last week, the remarks attributed to Mr. Whatmough were made by Mr. A. E. Mottram, of Ossett; the observations in the succeeding paragraph being those of the other gentlemen named.

The London and Southern District Junior Gas Association, who have hitherto transacted their business at the Regent Street Polytechnic, are arranging to hold future meetings in the Small Hall at the Cripplegate Institute, which is near Aldersgate Street Station. Members will have an opportunity of seeing this room on Wednesday, the 19th inst., when a paper will be read by Mr. L. F. Tooth on "Lighting and Maintenance."

An Invitation to an Electrical Editor.—Having drawn the conclusion from the interest our contemporary "Electrical Industries" takes in gas matters that the Editor is a person without prejudice, Mr. Ernest L. Burton, the Secretary of the North Middlesex Gas Company, has invited him to pay a visit to Finchley during the hours of darkness, and see for himself how the public lighting of the streets by electricity should not be done. "It is probably," says Mr. Burton, "the most melancholy attempt at electric incandescent street lighting to be found anywhere in London or its suburbs. If you can upon the same occasion spare the time to visit the neighbouring district of Hendon, you will, in your impartiality, be able to testify to the abundant success of the incandescent gas system adopted by the Hendon Urban District Council for lighting the highways throughout the district. These facts are noted by the dwellers in those parts; and it is not surprising that they give effect to the knowledge thus gained by deciding (in at least the great majority of cases) in favour of gas for lighting their homes and offices, the adaptability of electricity for 'concentration' purposes notwithstanding."

MODERNIZATION AT TAMWORTH.

No gas engineer in the present day—given a sympathetic and progressive Board of Directors and an expanding district and business—would work under the, in comparison with present operation, old uneconomical conditions that obtained some years ago. The discarding of old plant, and the adoption of new, often mean that the economies realized by the change well transcend the liabilities that the outlay involves in applying the modern methods. There appears to have been a time in connection with the Tamworth Gas Company when inertia on the part of the supreme part of the administration—no matter how eager the chief official of the concern may have been to be on the move—caused business development to go forward at a monotonous pace. The men changed in whom the direction of the affairs of the Company was reposed; and with the change, the spirit of progress—the anxiety to do better—of the Engineer and Secretary (Mr. W. A. Sapey) was relieved of the curb, and given that play which had long been sought. The result will be disclosed as this descriptive account of what has been done is unfolded. The present is an opportune time to give a view of the work and results achieved, inasmuch as last Thursday witnessed the inauguration of the, for the time being, final and important part of the scheme of improvement that has been proceeding quietly but surely, and with good effect within the works and in the district during the past few years. At this inauguration, the Chairman, Mr. M. S. Wales, J.P., his colleagues, and Mr. Sapey, had gathered round them the Mayor, Mr. A. J. Bartle, J.P., the principal officials of the Corporation, a few other prominent



Plan of the Tamworth Gas-Works.

[W. A. Sapey, Engineer.]

townsmen, and a number of the engineers of neighbouring gas undertakings—all interested in what had been done, all filled with the best of wishes for a continuance of the flow of the stream of prosperity that recent years have seen running.

The History of the Company Briefly Stated.

Before particularly describing the latest of the additions at the works, the history of the Company may be narrated in brief. The Company was incorporated by Special Act of Parliament in 1872. Five years later, the amount of gas consumed for the twelve months was only 9,735,000 cubic feet; and the capital of the Company was £12,980—gas being sold at 5s. 6d. per 1000 cubic feet. The output slowly increased until 1892, in which year the consumption was 16,868,000 cubic feet, and the capital £16,440.

During the last-named year, and following the death of the Manager (Mr. E. Sapey), friction arose between the directorate and the shareholders, as a result of which the then Chairman was deposed, and a new directorate elected. The new Chairman, Mr. Wales, together with the new Directors, took steps to place the Company on a firm basis, and adopted a progressive policy, which resulted in the double advantage of a lowering of the capital per million cubic feet of gas sold, and the reduction of the price of gas to the consumers. Mr. W. A. Sapey, the present Manager, was appointed to this position and that of Secretary in February, 1893. Gas-stove exhibitions were held and the slot meter was introduced, the result of which was a great increase in consumption. The works were soon found to be too small to cope with this increase; and it was decided to enlarge.

The first step in this direction was taken in 1895, when an old single-lift gasholder of the counterbalance type was dismantled; and a spiral-guided, double-lift one, on the Gadd and Mason principle, was substituted. A new purifying-house and a lime-shed were also built; and four new purifiers, 14 feet square, were put in. In 1896, a boiler and engine house was built; and a vertical Anderson engine and exhauster were laid down.

The consumption still rapidly increasing, it was found necessary to make further additions to the plant; and in 1899, two tower scrubbers, 7 feet in diameter and 50 feet high, four vertical condensers, 27 feet high, having outer tubes, 3 ft. 6 in. diameter and inner tubes, 2 ft. 9 in., were erected. Another Gadd and Mason gasholder, 82 feet in diameter by 25 feet deep, prepared for a second lift, was built. These extensions were carried out by Messrs. R. & J. Dempster, of Manchester.

During this period, the old-fashioned direct-fired settings were becoming worked out, and unable to cope with the increases. After due consideration, the Directors, on the advice of their Engineer, decided that it would be to their advantage, instead of spending money on renewals and enlargement of the old retort-house, to erect an entirely new one and equip it with modern regenerator settings—thus bringing the works entirely up-to-date. Drawings and specifications were prepared by the Engineer, Mr. Sapey, and were adopted by the Board. The whole contract for the retort-house, bench, and settings (which are described later) has been carried out, under the supervision of the Engineer, by the Winstanley Speciality Company, of Birmingham—represented on the work chiefly by Mr. H. M. Winstanley.

The new retort-house is the latest of the additions; but preceding its erection, two new engines and exhausters of the three-blade type, and capable of passing 15,000 cubic feet of gas per hour, were put in by Messrs. George Waller and Co., to replace the vertical exhauster.

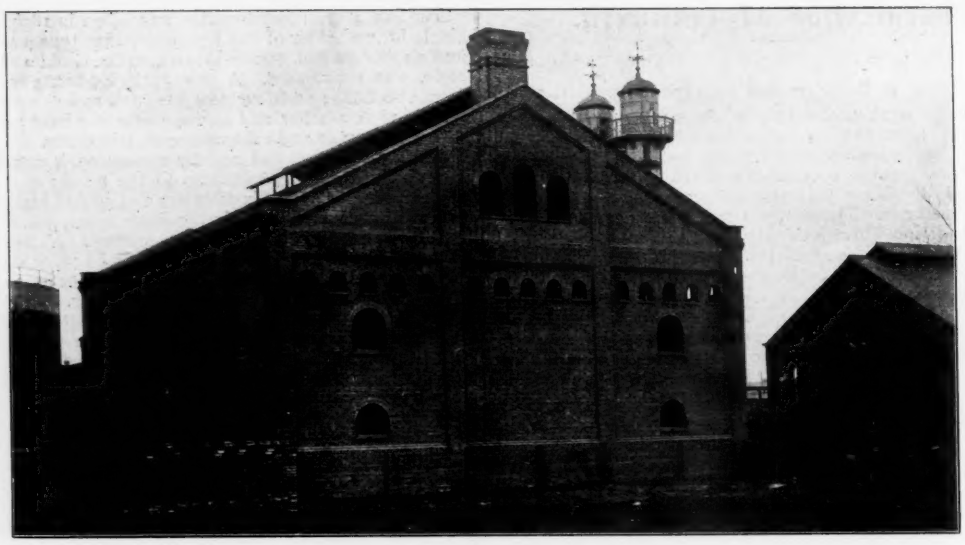
The works, it is satisfactory to learn, are now in such a position that, with a comparatively small outlay of capital, they can be made capable of producing more than double their present output of gas. The consumption has reached about 40 million cubic feet. There are 600 cookers on hire, and 1150 slot meters. The present price of gas is 3s. 6d. per 1000 cubic feet, with a discount of 2½ per cent., and 2s. 6d. per 1000 cubic feet for power purposes. The total capital of the Company, with the last issue, is £24,060, or about £600 per million cubic feet sold. Truly, the whole position is one for satisfaction and congratulation.

The New Retort-House.

Naturally on Thursday, the new retort-house was the centre of attraction; and to it the visitors on assembling immediately repaired, accompanied by the Chairman and other members of the Board, with Mr. Sapey and Mr. George Winstanley and Mr. H. M. Winstanley. Prior, however, to inspecting the new work, a glance was taken at the old carbonizing plant. And old it is. The settings are on the direct-fired principle; and if their dilapidated condition is eloquent of anything at all, it is that they long since must have passed the stage of economical service as part of the manufacturing plant. The visitors had only to look on the old picture, and then on the new, to say that the Directors had, in the interests of Company and consumers alike, done the proper thing. General details of the new house and its equipment will prove of interest.

The house has been erected as a continuation of the old one, which, when it is cleared, will supply the Company with a magnificent coal-store—of a capacity that will serve their requirements for many a year to come. From the store the coal will eventually be raised to the stage-floor by some mechanical means—by, as inquiry satisfies Mr. Sapey as to expediency, either a lift as used in connection with water-gas plants or an inclined elevator. For the time being, the coal is stored in the open. Preparatory work to building the new house included the clearing of the site, on which stood the old coal-store and the blacksmith's shop; and the whole of this was included in the contract with the Winstanley Specialty Company. Special care had also been taken in the design of the house, and in the foundations, in view of the fact that there is a liability to flooding from the adjoining river. Hence the adoption of the stage-floor principle. But now there is on the site a fine looking house, that does not require any caution in saying is fit for standing the wear and tear of (at present) innumerable years to come. The house is 68 feet long by 60 feet wide inside; and the height from the floor-line to the underside of the shoe of the roof principals is 26 feet. Under the walls is a bed of concrete, 3 feet wide and 12 inches thick. The special precautions that had to be taken over the foundations for the reason given above, caused them to be a very costly item; the excavations and concrete having to be taken to a depth of 8 feet below the yard-level. The walls—which have been built of brindled bricks, famed for their great durability—have a thickness from the top of the footing courses to the plinth course of 1 ft. 6 in. The piers are 1 ft. 6 in. thick; and, between the piers, the brickwork is 14 inches thick, pannelled out to 8 inches above the stage-floor level. The photograph shows the design of the house; and its numerous openings for ventilation and light will be noted. All the arches are turned with best blue bricks; and the sills and plinth-courses are also of blue brick.

The roof is built up of five strong steel principals and five secondary principals; the latter being supported from the main principals on substantial trussed purlins. Along the full length of the roof is a ventilator, 11 ft. wide by 2 ft. 6 in. high. The roof



View of the New Retort-House at Tamworth.

and ventilator are covered with steel angle purlins for carrying the slates, which are those known as Best Bangor.

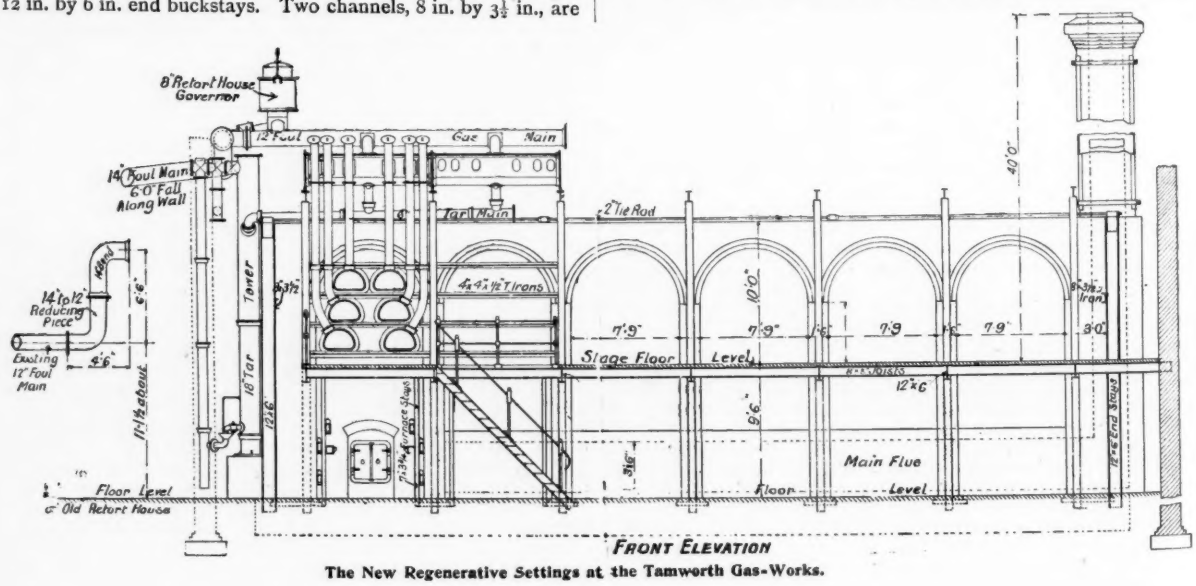
The description of the retort-bench may be preceded by a few notes on the stage-floors. They are built up of 12 inch by 6 inch main cross joists, each supported by the walls and the bench buckstays and in the centre on a cast-iron column (7 inches in diameter at the top, and tapering to 9 inches in diameter at the base). Between these main floor-joists are fixed 8 inch by 5 inch longitudinal joists and 8 inch by 3½ inch channels which serve as supports for the brick arches turned between them. The spandrils of these arches are filled with concrete, and the whole covered by blue bricks laid on edge to form the floor. The stage-floors are reached by an iron stairway on each side of the house.

Coming now to the retort-bench, we see a splendid piece of constructional work, the clean and perfect finish of which was the admiration of the expert visitors on Thursday. From the information gleaned, it was learned that the bench of six arches, each 7 ft. 9 in. wide, stands on a bed of concrete 60 ft. long by 26 ft. wide; and, as in the case of the house itself, it was found necessary to carry the foundations down to a depth of 8 feet below the yard-level, owing to the swampy nature of the ground. The foundation for the chimney was also provided at the same time. The chimney stands at the end of the bench. The portion of it outside the end wall of the bench is 14 inches thick, made up of 9 inches of fire-brick and 4½ inches of red brick to the level of the top of the bench. From this point, the chimney is built of 9-inch firebrick for a height of about 40 feet, terminating in a cap of brindled bricks, set in cement. The inside dimensions of the chimney are 4 ft. by 2 ft. 6 in.; and it is braced by corner steel angles the whole distance up, with five sets of cross steel flats on all sides.

At present only two of the arches of the bench have been filled in, each with six ⌂ retorts, 26 in. by 16 in. by 20 ft. long; and the regenerators have been put in up to the stage-floor line in two more, ready for completion next year. The bench is braced by fourteen 12 in. by 6 in. front and back buckstays; and eight 12 in. by 6 in. end buckstays. Two channels, 8 in. by 3½ in., are built in the end of the bench; and the hydraulic and foul mains are carried by 8 in. by 6 in. girders. The longitudinal tie-rods are 2 inches in diameter; the furnace stays are 7 in. by 3¾ in. The mouthpiece stays are formed of 4 in. by 4 in. by ½ in. steel tees. The ascension-pipes and arch-pipes are 6 inches diameter; and the hydraulic main is on Winstanley's patent principle and measures 2 feet wide and 2 feet deep. The gas is taken off from the top of the hydraulic mains through 8-inch diameter cast-iron pipes, with one internal rack-and-pinion valve to each hydraulic main. The collecting-mains are 12-inch diameter, and are connected to the 14-inch foul main running across the house, by the old chimney, and for a distance of about 56 feet along the side wall, coupling with the existing main. The tar and liquor outlets are 6 inches in diameter with a 4-inch connection to each hydraulic main. At the end of the bench, they connect with a Dillamore tar column, 18-inches diameter by 21 feet high. On the outlet of the tower is a weir-valve, by means of which the seals on all the dips are regulated. Mr. Sapey recognizes the advantage of equalizing conditions in his retorts by the use of an 8-inch governor fitted on to the foul-gas main. In connection with the working of the house, it may be mentioned that, pending the old retort-house being brought into use as a coal-store, and some mechanical lifting arrangement being adopted, the coal supply for the new benches is brought to the stage-floors from the yard up a temporary incline. With regard to coke removal, shoots, having hinged covers and supported on the 8 in. by 5 in. longitudinal joists, are carried through the stage-floors; and these direct the coke into hand barrows in the basement; the barrows being wheeled into the yard.

Excellent Working Results.

This completes the description of the new building; but there are a few observations to be made on the operations. Shovel charging is, of course, the vogue with such few retorts in use. The heats of the retorts, it was observed, were good and equal throughout the 20 feet length. Excellent working there need be in these beds, as the twelve throughs are doing all the work this



The New Regenerative Settings at the Tamworth Gas-Works.

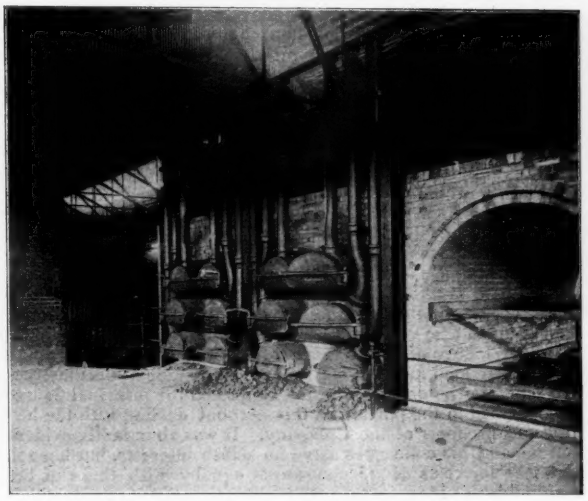
winter that the 54 backed retorts, in the direct-fired settings, were doing in the old house; these old retorts being disposed in eight beds of fives and two beds of sevens. It is interesting to remark this point; and to consider what it all means in the saving of space, fuel, capital, wear and tear, and labour (Mr. Sapey is keeping all his old men on, but they are equal to more work when more beds have to be filled). The figures as to the results of the working of these retort-settings are worth particular mention. Something like 10,000 cubic feet of gas per mouthpiece are now being produced; and, heavy make as this is, the retorts are not being pushed, so that their productive capability is not exhausted by this good showing. The fuel consumption, too, is under 11 per cent.; and this again is excellent. When the other settings are brought into use, the Contractors guarantee a fuel consumption of only 10 per cent. From their experience at other works, the Winstanley Speciality Company estimate that the life of this type of regenerator is well within the mark if put at ten years. Taking all these facts into consideration, Mr. George Winstanley at the celebration dinner on Thursday evening claimed, as quite legitimate, the application of the term "best" to his Company's system of regenerative-setting, and asserted that the firm were quite prepared to defend the claim in a practical manner. However this may be, all associated with the Tamworth Company are highly gratified with what has been achieved by the change from ancient to modern carbonization; and throughout the day the Chairman, his colleagues, and Mr. Sapey were complimented on the great step they have taken in passing so completely from the obsolete to the modern, and in having made such good prospective provision, which will demand the minimum of outlay to supplement the output capacity.

A Presentation.

While on the stage-floor in the new retort-house, the Chairman of the Company welcomed the visitors. He pointed out what he thought was obvious to all, that the works were small; but the business was increasing, and a few years hence, he was safe in saying, it would be much larger than now. What the Company had been doing was to be off with the old love, and on with the new. The new retort-house, he was glad to testify, had been built and equipped well within the time specified in the contract, by the Winstanley Speciality Company, with the greatest satisfaction to the Engineer and the Board of Directors. He declared the house open.

Then there was a pleasing and unexpected incident. Mr. George Winstanley, on behalf of the Contractors, presented the Chairman with a beautiful designed gold key, remarking in so doing that, although there was not a door to unlock, they would like the Chairman to accept the key as a memento of the occasion. Thanking Mr. Winstanley, the Chairman observed that he could hardly find words to express his appreciation. There was, it was true, no door to unlock; but he would take the key out, and imagine a door to unlock and open. And the genial Chairman followed the words by action, amid the applause and amusement of those gathered around him.

His Worship the Mayor proposed a vote of thanks to the Chairman. As the chief official representative of the borough, he expressed the hope that the new retort-house would be exceedingly successful, and assist in giving the town a good supply of gas. He added that he had known Mr. Wales ever since he came into the town, now over 40 years ago. His geniality and conscientiousness were recognized throughout the borough; and the shareholders might very well leave their interests in his hands, knowing that what Mr. Wales did he did well.

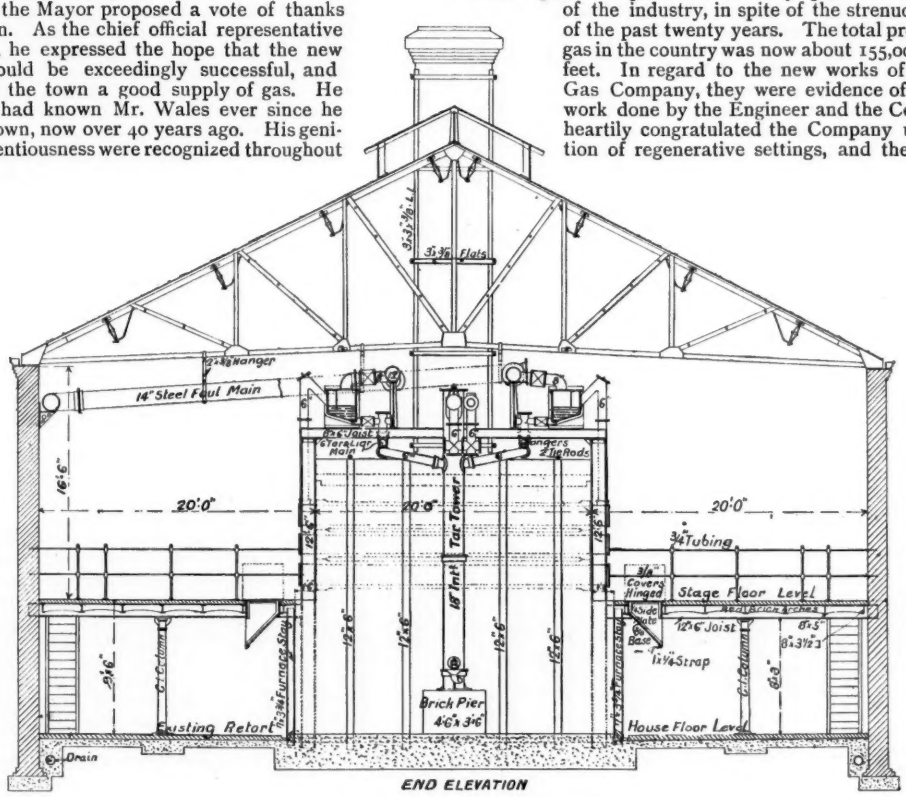


The Filled-In Settings of the New Bed.

The proposition was endorsed with enthusiasm; and the Chairman briefly responded.

A Celebration Dinner.

After the works had been fully explored, the company wended their way to the Castle Hotel, in the fine banqueting room of which the event was celebrated by a dinner. The Chairman presided, and was supported by, among others, his fellow Directors—Dr. A. M. Sculthorpe, Alderman W. Tempest, and Mr. T. J. Hill—the Mayor (Mr. A. J. Bartle), the Town Clerk (Mr. J. Matthews), the Borough Surveyor (Mr. F. E. G. Bradshaw), and the District Surveyor (Mr. H. J. Clarson). After a generous repast, the toast of "The Gas Industry" was submitted by Mr. Charles Fenn, of the Stourbridge Fire-Brick Company. Speaking of his personal experience of both gas and electric lighting, he declared, without reserve, that gas was the light of the present. He spoke of Dudley, and of the fact that there the Corporation had been to considerable expense in putting down electric lighting plant, but the feeling among the ratepayers against electricity was now much greater than it had ever been. Mr. H. Pooley, of Stafford, Mr. B. W. Smith, of Walsall, and Mr. Fletcher Stevenson were called upon to respond. Mr. Pooley spoke of the great progress of the industry, in spite of the strenuous competition of the past twenty years. The total production of coal gas in the country was now about 155,000,000,000 cubic feet. In regard to the new works of the Tamworth Gas Company, they were evidence of the substantial work done by the Engineer and the Contractors. He heartily congratulated the Company upon the adoption of regenerative settings, and the application of



END ELEVATION

The New Retort-House at Tamworth.

other modern and approved methods of working. The reduction of the capital to £600 per million cubic feet was testimony to prudent management; and from what was seen at the works, that figure would come down considerably as the business increased. Mr. Smith also asserted that the new retort-house and settings reflected great credit upon the designer and the Contractors. At Walsall, where, following his appointment, he spent £56,000 in one year, in recovering lost ground, they were now reaping the benefit; and at Tamworth he had confidence in saying they would do likewise. Mr. Fletcher Stevenson agreed that the money that had been laid out on the new works had been well spent. He knew of a case in which the system of direct firing of retorts was abandoned, and regenerative furnaces were adopted; and all the outlay was recouped in three years.

The toast of "The Tamworth Gas Company" was submitted by Mr. Robert Neville. In the course of an interesting speech, he remarked that he was confident the new works would redound to the advantage of the consumers, and in that capacity he was chiefly interested in them. The Chairman made a most instructive reply, in the course of which he quoted the principal figures incorporated in the portion of this account dealing with the history and progress of the Company. It was abundantly evident that he and his colleagues serve no selfish interests, but keep in view the interests of the consumers equally with those of the shareholders. He referred with great satisfaction to the fact that while in 1877, with a consumption of 9 million cubic feet of gas, the capital was £9000, now with a make of 41 millions the capital was only about £24,000, or £600 per million.

In his usual felicitous style, Mr. Charles Meiklejohn, of Rugby, gave "The Town and Trade of Tamworth;" and his Worship the Mayor responded. Dr. Sculthorpe proposed "The Contractors;" and passed high encomiums upon their work. Mr. Winstanley replied; and mentioned figures as to the results achieved by the new settings, which results have already been cited. "The Manager and Secretary" was submitted by the Chairman; and at the conclusion of his remarks there was no room for doubt as to the confidence the Directors repose in Mr. Sapey, and of which confidence he has proved himself highly worthy. Mr. Sapey's reply was an appreciation of the kindness of the Chairman and Directors, and of the whole-hearted support they gave to his efforts on behalf of the Company. The results of these efforts have been shown in the course of this article. The last toast, proposed by Mr. Cast, was "The Chairman," and that was drunk with musical honours. Modest were the Chairman's remarks in reply; but he was proud of his position, as well as of the Company, in connection with which he exercises something analogous to a paternal interest.

Interspersing the toasts were song and recitation; and throughout it was a happy evening to a red-letter day in the history of the Gas Company of the ancient borough of Tamworth.

INSTITUTION OF CIVIL ENGINEERS.

Three Papers on Water Questions.

At the Ordinary Meeting of the Institution of Civil Engineers last Tuesday, three papers dealing with water supply were read. They were "The Talla Water Supply of the Edinburgh and District Water-Works," by Mr. W. A. P. Tait, B.Sc.; "Repairing a Limestone Concrete Aqueduct," by Mr. M. R. Barnett; and "The Yield of Catchment Areas," by Mr. E. P. Hill. The following are abstracts of the papers.

The first paper dealt with the new supply lately introduced from Talla, one of the head waters of the River Tweed; and occasion was taken by the author to review shortly the other proposed sources of supply which for a time were under consideration. Attention was directed to the results of borings and trial pits at other sites which were considered—viz., St. Mary's Loch and the Manor Valley. A statement was given of the population and water consumed for domestic and trade purposes in 1870 and at the present date.

Attention was directed to various points in the Act authorizing the construction of the works. For instance, there was some diversity of opinion as to the available rainfall. The steps taken to appoint Arbitrators to determine this, and the subsequent amount of compensation water, were dealt with. The basis upon which the Arbitrators proceeded in considering and issuing their award was fully placed before the Institution.

The general features of the valley in which the Talla reservoir is placed were described, and some drawbacks to Talla as a really good reservoir site—including the total absence of suitable clay for puddle and of good building stone—were referred to. A general description was given of a railway, 10 miles in length, which was constructed to the reservoir from the nearest point on the Caledonian Railway, for bringing up clay, building materials, &c. The general design of the reservoir embankment and puddle trench was described, and changes in the design brought about by various causes were indicated. Mention was also made of the timely discovery that water was escaping outside the lining of the outlet tunnel from the reservoir. The probable cause of this, and the method of preventing subsequent leakage, were dealt with. Particulars were furnished of the outlet works and of the gun-metal valves adopted. A general description of the aqueduct was given, and various troubles encountered in its construction were related. The method of timbering adopted in some of the soft tunnels was described. For one of the tunnels, recourse was had to compressed air without a shield; and the process of driving and the plant used were explained.

The paper concluded with a statement of the cost of the work and also statistics of the Edinburgh and District Water Trust's rating and revenue; and to it were appended tables of the rainfall on the Talla drainage area for 10 years, and also a series of gaugings of springs extending over 43 years.

The second paper contained a description of the work of repairing a short length of the Thirlmere aqueduct which conveys water from Thirlmere to Manchester. The aqueduct, which is nearly 96 miles in length, was completed and brought into use in October, 1894. After the water had been flowing through the aqueduct for a number of years, it was found that the full quantity was not being received at Manchester; one of the causes being that considerable leakage was taking place in the concrete culvert portion of the aqueduct at Hutton Roof—a length of nearly three miles. For several years, repairs were carried out in this length; but they did not stop the leakage, as it was found that it began at fresh places. The author, who had been Resident Engineer in the same district during the original construction of the aqueduct, and had returned in connection with the laying of a second line of pipes, was requested to investigate this matter and carry out the necessary repairs.

The first work was to test the length in question, in order to locate the leakage. This was done by fixing timber stanks across the culvert at the manholes. They were made with a rectangular opening, which was large enough to pass the water through to Manchester, but could be closed with a wooden door during the tests. The main divisions were further subdivided into 4-chain lengths and tested. The tests proved that there was a total loss of more than 1¼ million gallons of water in 24 hours when the aqueduct was running full; and they also indicated where the leakage was occurring, and its relative extent.

The work of repairing was started in the section at the north end, where the leakage was found to be greatest. On making an examination of the concrete in this length, the author found that the cause of the leakage was the action of the soft water from Thirlmere on the limestone in the concrete of which the Hutton Roof section had been built. Holes were found in the floor of the culvert by which the water was escaping, and all the small individual pieces of limestone were found much water-worn.

The author made experiments to ascertain the rate of the action of the soft water on the blocks of limestone; and the portland cement and mortar (1 part of cement to 1 part of sand) used for the repairs were similarly tested. Chemical analyses were made of the limestone from which each of the blocks was prepared, as well as of the portland cement and the sand, and the results of these tests and analyses were given in the paper. After three months' immersion, the rate of wastage of the blocks varied from 6·83 to 18·10 per cent. per annum; and after six months' immersion, from 6·75 to 17·09 per cent. per annum. The sample blocks of portland cement and mortar, instead of losing, actually gained slightly in weight—viz., the cement block 5·47 per cent., and the mortar block 3·57 per cent., per annum.

It was decided that the whole water surface of the concrete in which limestone had been used should be faced again with portland cement mortar not less than 1 inch in thickness. The methods adopted in removing the necessary thickness from the old concrete, and in applying the new mortar facing, were described in detail in the paper. The mortar was put in between timber framework fixed so as to give the correct thickness and maintain the original dimensions of the culvert. The surface of the invert was hacked off and re-plastered.

A description was given of various special circumstances arising during the execution of the repairs and of the nature of the various holes, &c., met with. Though the removal of the surface of the concrete in the culvert was a very searching test, the whole of the concrete in the Hutton Roof section of the aqueduct was found to be excellent in quality, so far as the workmanship was concerned, and could not be improved upon in this respect. The way in which the outside water was dealt with was described. In all cases free vent was given to the water by the insertion of pipes of suitable diameter, and these were carried up the side walls to above the top water-level.

The author of the third paper pointed out the deficiency of data for computing the yield of drainage areas for water-works purposes, and the necessity for such data in utilizing the areas in the most economical manner, having in view the few suitable ones yet remaining unappropriated. Reference was made to the difficulties encountered in making stream gaugings on a large scale, and recording the observations continuously. The present method of estimating the yield by rainfall observations combined with assumptions as to loss by evaporation and rate of flow in the streams, was next described. Finally, the author urged the necessity for every water-works being utilized as an experimental station, and for water authorities keeping an account of water received and expended, like a banking account, as a condition of their being allowed to appropriate a portion of the national sources of water supply.

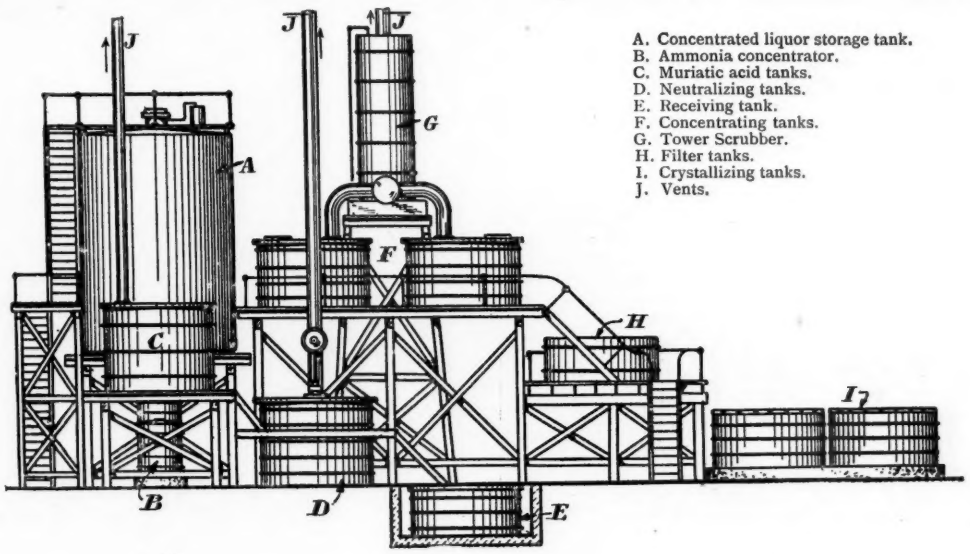
CHLORIDE OF AMMONIA MANUFACTURE.

A recent number of the "American Gaslight Journal" contained the following article on the above subject, communicated by Mr. R. W. HILGENSTOCK, of the Ammonia Department of the Gas Machinery Company, of Cleveland (Ohio).

Chloride of ammonia (sal ammoniac) is formed by the chemical combination of one part of ammonia (NH_3) with one of dry hydrochloric acid (HCl). Its chemical formula is NH_4Cl. The process of manufacture is by no means complicated, and the following is a general description of it. The apparatus is shown in fig. 1. The crude gas liquor, as it leaves the scrubbers or washers in gas-works, is concentrated in an ammonia concentrator to about 15 or 19 per cent. strength, and mixed with sufficient muriatic acid, containing about 33 per cent. of dry hydrochloric acid, until a slightly alkaline solution is obtained. This is concentrated by boiling, and, after filtering, is drawn off into crystallizing-tanks, where the sal ammoniac crystals form. These are taken out and dried, while the mother liquor (after having been mixed with fresh neutralized liquor) goes back into the boiling-tanks, where it is again concentrated.

At 60° Fahr., a saturated solution of sal ammoniac, having a specific gravity of 1·077, contains about 26·25 per cent. When 100 lbs. of concentrated ammoniacal liquor of 17 per cent. NH_3 (therefore containing 17 NH_3) are treated with muriatic acid, 36·4 lbs. of dry hydrochloric acid are needed for saturation. As chemically pure muriatic acid of 21½° Baumé contains 36·4 per cent. HCl, 100 lbs. will be required to neutralize 100 lbs. of 17 per cent. ammoniacal liquor. As commercial muriatic acid of 20½° Baumé, containing about 33 per cent. HCl instead of 36·4 per cent., is generally used, 110 lbs. are necessary to neutralize 100 lbs. of 17 per cent. liquor, forming 17 + 36·4 = 53·4 lbs. of sal ammoniac.

Concentrating the Weak Gas Liquor.—The crude gas liquor is



A. Concentrated liquor storage tank.
B. Ammonia concentrator.
C. Muriatic acid tanks.
D. Neutralizing tanks.
E. Receiving tank.
F. Concentrating tanks.
G. Tower Scrubber.
H. Filter tanks.
I. Crystallizing tanks.
J. Vents.

Fig. 1.

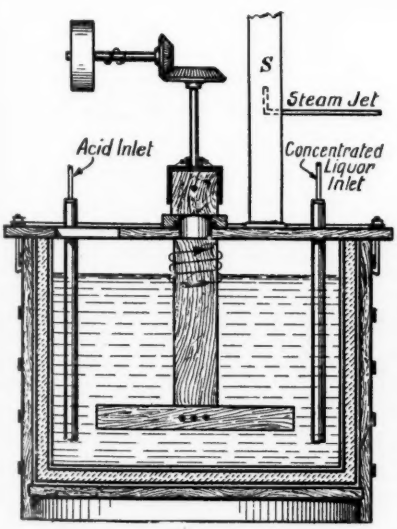


Fig. 2.

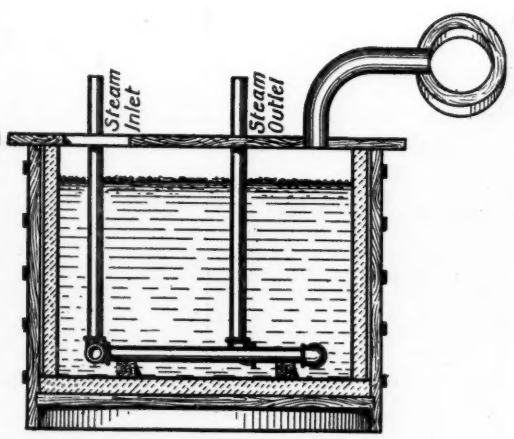


Fig. 3.

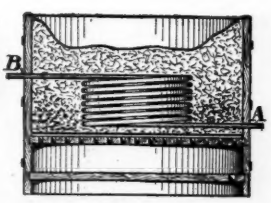


Fig. 4.

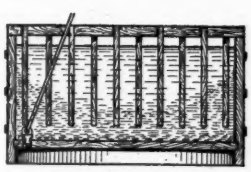


Fig. 5.

Apparatus for the Manufacture of Chloride of Ammonia.

pumped from the well into the overhead feed tank; care being taken to pump slightly more than is admitted to the still—the excess overflowing through the catch-pot back into the weak liquor storage well. Steam of uniform pressure is admitted into the bottom compartment of the still; the liquor being made to flow into the section near the top. The liquor flows downwards and the steam upwards through the various sections; the former soon beginning to boil. The volatile ammonia is liberated gradually; the liquor coming in contact with purer steam the farther down it travels.

The liquor, when practically free from volatile ammonia, flows into the liming-leg, where it is intimately mixed with milk of lime. This lime combines with the fixed ammonia compounds, making them volatile. The solution of liquor and lime passes down through the liming-leg, which has a peculiar interior construction to obtain the most efficient working, into the fixed still. The steam gradually volatilizes the ammonia, which passes with the steam through the volatile still up to the top, through the section called the "heater," where part of the steam vapours is condensed by heating the inflowing cold weak liquor. In order to condense more water vapours, a "cooler" section is arranged on top of the "heater."

The ammonia and remaining water vapours pass through a pipe into the absorber, which consists of several cooling sections, mounted one above the other, and arranged to condense the vapours. This condensation absorbs the ammonia gas, and is gradually cooled and concentrated until liquor of the desired strength is obtained. This strength can be varied by changing the temperature of the vapours admitted to the absorber. A thermometer is provided on the top section of the absorber, and the temperature can be regulated by varying the quantity of steam at the still or the amount of cooling water at the cooler section.

The cooling water of the absorber is made to travel in the opposite direction to the flow of vapours and liquor—thus requiring a relatively small quantity of water as compared with

concentrators of different construction. A glass globe covered overflow, in which a hydrometer can float, is provided at the outlet of the absorber—thus showing the operator at all times the amount, as well as the gravity, of the liquor being made.

The concentrator works continuously, and requires but little attention after the valves governing the amount of weak liquor, steam, and water have once been set. Samples must be taken from time to time of the concentrated liquor as well as of the waste water, so that irregularities may be discovered. An ammonia pump (which is made of iron) in the pump compartment transfers the concentrated liquor to the overhead storage-tank, from which it can flow into the neutralizing-tank.

Neutralizers.—The neutralizing-tanks, in which concentrated liquor and muriatic acid are mixed, are made of wood, and have a lining of hard-burnt clinkers, laid in sulphur and glass dust. The dimensions depend on the desired daily production of crystals; but they must be of ample capacity to supply the boiling and crystallizing-tanks if for any reason the supply of concentrated ammoniacal liquor or muriatic acid may be temporarily stopped.

A section of a neutralizing-tank is shown in fig. 2. The acid and ammonia inlets are hard rubber pipes through which muriatic acid and concentrated ammoniacal liquor flow into the tank. The paddle is for mixing these two liquids thoroughly. S is a wooden stack, provided with a steam-jet to draw off the noxious vapours, which are to be piped into the chimney of the boiler-house, or else the sulphur contained in them may be recovered. Valves must be regulated so that the solution in the neutralizing-tank is always "acid," in order to avoid losses of ammonia. The acid valve is entirely closed when the tank is almost full, and only enough ammoniacal liquor is added until a sample of the solution shows a clear "wine yellow" colour, when a few drops of methyl-orange are added. The liquor is now drawn off by means of a rubber-hose into the receiving-tank, where it is mixed with the mother liquor obtained from the crystallizing-tanks. The receiving vessel is a plain wooden tank. If a sample of the neutralized fluid contained therein shows a red colour when a few drops of methyl-orange are added (thus indicating an acid solution), some more ammonia must be added, as a "sour" solution will badly attack the pumps and the coils in the concentrating-tanks. After having made sure that the fluid is properly neutralized, it is pumped into these tanks.

Concentrators.—The concentrating-tanks are made of wood (fig. 2), lined with hard-burnt clinkers laid in best Portland cement. A lead or cast-iron steam-coil heats the neutralized liquor. By evaporation, this is concentrated until a distinct white skin is swimming on the top, which shows that the solution is properly saturated. If the plant is built near the residential district of a city, the escaping vapours of these tanks are passed through a tower scrubber, fitted at the bottom with chemical bricks, having above them a deep layer of coke kept moist by a spray, to remove the bad smell. The saturated liquor is drawn from the concentrating-tanks through a short rubber hose into the filter-tanks.

Filters.—The filter-tanks are also made of wood, provided with a false wooden bottom, on which boneblack of different size is piled. On the top of the boneblack is a filter-cloth. To avoid crystallization in the boneblack, a small steam coil is arranged to keep the liquor hot. The steam is admitted at A and leaves at B (fig. 4).

Crystallizing-Tanks.—The filtered liquor flows through a square trough, then into one of the crystallizing-tanks, which are made of wood (fig. 5). The liquor cools in these tanks. After its temperature has dropped sufficiently, and the crystals have formed, the mother liquor is drawn off through a 2-inch outlet at the bottom of the tanks into a square wooden trough, and used over again in the receiving tank, as described above.

Dryer.—The fine white crystals, which have formed on the walls, crystallizing-sticks, and bottom, are taken out and partly dried in a centrifugal extractor. But as the moisture can in this manner only be reduced to 2½ per cent., the crystals must afterwards be dried on a drying-table. Glazed terra-cotta tiles are laid on small brick piers in very rich clay. The crystals must be continuously turned over while being dried, otherwise they bake together, and stick to the drying-table as well. The heat is furnished by the exhaust steam from the coils in the concentrating-tanks. When the crystals are dry, they are packed in casks and barrels, and are then ready for shipment.

Pure sal ammoniac crystals are white. They may vary in size from fine powder to granulated sugar crystals. Commercial sal ammoniac has a colour varying from grey to a light brown, due to the iron compounds and other impurities that may be contained therein.

At St. Mark's Church, Sheffield, last Tuesday, the marriage was celebrated of Mr. William A. M'Intosh Valon, the third son of Mr. W. A. Valon, with Miss Edith Robinson, the only daughter of the late Mr. J. W. Robinson. After the ceremony, the bride's mother held a reception at her residence; and subsequently Mr. and Mrs. Valon, who were the recipients of many handsome presents, left, amid hearty congratulations and good wishes, for Harrogate. Mr. Valon was for some time Assistant to Mr. J. W. Morrison, the Engineer of the Sheffield Gas Company, and is now Assistant-Manager of the South Shields Gas-Works.

GAS DISTRIBUTION IN AMERICA.

Report of the Board of Revision on Distribution of Gas, with a General Progress Report by Dr. H. B. Harrop, the Chairman of the Board of Revision, to the First Annual Meeting of the American Gas Institute, held at Chicago, 1906.

Before proceeding to notice the subject proper of this work, it may be desirable to give a brief *résumé* of the constitution and objects to be effected by the Board of Revision, as set forth in the General Progress Report, and the special preface to the Distribution Section as embodied in the present report, especially as it gives a promise of other good things to come.

At the 1904 meeting of the Ohio Gaslight Association, it was proposed to organize a Board to undertake the work of revising the Question Box, which consisted at that time of two volumes. [This publication has already received extended notice in these columns, and our readers will therefore be fairly familiar with it.] This of itself would be a large undertaking; but the Board received a still more extended order—viz., to combine with the condensed matter material from outside sources, to frame up the beginnings of a gas compendium which might grow in the course of years, with the general co-operation of the gas fraternity, to an encyclopedia of the gas industry. From this, it appears that the Board are to revise not only the Question Box of the Ohio Association, but every other published matter relating to gas. We well believe, after some little experience in abstracting and cutting down bulky reports into convenient form, that it is difficult for anyone not actually engaged in the work to realize its magnitude, and admire the courage of the Committee, all of whom are already fully occupied by regular pursuits, and can only devote odd moments to this matter. Secretaries of Associations on this side of the Atlantic, who find difficulty in getting papers, may well envy the huge appetite for work which appears to emanate from Ohio, and which suggests the idea that in America the Secretaries may occasionally be embarrassed in finding outlets for the superabundant energy at their disposal.

The Board comprises eighteen members; and the work of interesting all the authorities concerned has been attended with a good measure of success. The first duty was the selection of a suitable classification of subjects; and this has been finally decided as follows: Coal, carbonizing and retort-house, condensing and scrubbing, purifying, gases other than retort coal gas, water gas, general operation of gas-works, residuals, distribution, meters, appliances, sales, and commercial policy. Outlined schemes of each section were divided out; each reviser being in the first instance responsible for the draft of the section submitted to him. The references to current literature contained in the answers, abstracts bearing on the various subjects, and other information procured independently, had all been previously looked up and combined with the assigned matter. The revised sections, when complete, were exchanged among the members, and subjected to further scrutiny; so that the responsibility for any statement should not rest on one authority only. In this work the assistance of many known to have special experience in any one detail, and outside the Board, has been secured. The Board in effect took the Question Box, cut out all that they considered to be duplicated, superfluous, or extraneous matter, re-arranged the remainder, and added notes to round out the subjects treated. The idea is that the work is to be revised each year, so as to admit of bringing in the latest available material from the current issue of the Question Box; thus laying the foundation for a complete treatise on gas. The material contributed to the first four issues of the Question Box, while full on some subjects, was very meagre on others; and it was observed that work founded on this source alone would be of an incomplete character. At the same time, while outlining a treatise on the subject in hand, there is no overstraining towards finality, as it is anticipated that other matter will be added in the later editions. The revision aims at being something more than a boiled-down Question Box—a revised up-to-date version of gas literature as a whole. The special preface sets forth that the present publication comprises the distribution section, and directs attention to the magnificent work done in connection with it by the Section Chairman, Mr. F. W. Stone, of Ashtabula, in undertaking the pioneer work connected with the first issue. The other sections, to be issued later on, will be in a position to profit by the organization embodied in this, which, to some extent, lays down the lines on which they will be constructed.

Having made this preliminary explanation, we are in a position to direct attention to the report proper, which comprises just over 100 octavo pages and a good number of illustrations and tables. Although spoken of in the prefaces as a report on distribution, the work itself is headed the Mechanical Aspect of Distribution; and we are informed in the opening sentences that the subject is treated as viewed by the man who is actually in charge of, or performing, the work. It is divided up into short sections, with sub-headings—the question and answer style being rejected; and but for the explanations above given, one might regard it as more in the way of a hash-up from the Wrinkle or Experience Departments that have become such familiar features at the American Gas Association proceedings. The headings themselves give a fair idea of the character of the work. Commencing with cast

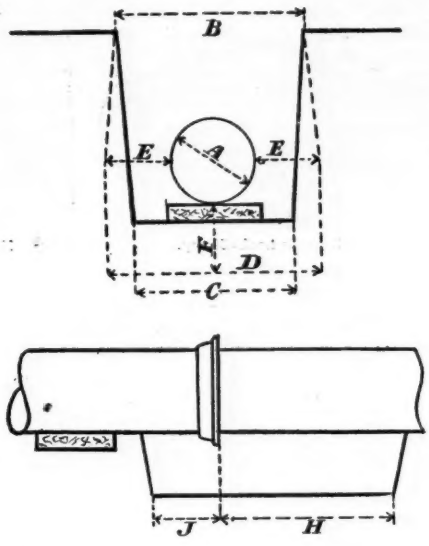
iron pipe, we are next introduced to cast-iron fittings (or "specials" as we should call them), then to tools for laying cast-iron pipe, unloading, lead and hemp, digging the trench, depth of main, grade of main, jointing with lead, lead *versus* cement joints, cement joints, new mains to existing mains, cutting cast-iron pipe, gas-main bags, wrought-iron low-pressure mains, tools, cements, fittings, and laying of same, connections to existing wrought-iron mains, drip pots, protecting from frost and corrosion, main records, refilling trenches, testing mains, other pipe, impromptu resistance meter, bending cast-iron pipe, fence and ditches, trusses for suspended mains, enlarging gasholder pipes, booster lines, governors, cross country artificial gas lines, long distance lines, surveying, pipe used, laying screwed pipe, fittings, plain-end pipe, crossing rivers, regulators, size of services, tools, records, connecting to mains, stopcocks, coating and protecting from frost, fittings, connecting meters, location of meters, prepayment meters, testing for leaks, leakage of gas, computing and testing for same, finding and repairing leaks, corrosion and its causes, complaints of poor pressure, complaints of leaks in house fittings, inside piping, methods of obtaining suitable pressure, flow of gas formulæ, and pumping gas. We give these items in full, as exemplifying the extent and scope to be attained in future editions, rather than of the work done at present, because many of them are disposed of in two or three lines, and in very few instances can it be claimed that the completeness indicated in the preface is yet reached.

The work is presumably intended to form a book of reference for the use of members of the Association, and in all text-books it is usual to assume a certain amount of technical knowledge on the part of the reader. But in this work every little detail is repeated, with the result that the really valuable practical information dispersed throughout the work is encumbered with a great deal of useless verbiage of the "first catch your hare" order, comprising obvious truisms that must be evident to any person of ordinary intelligence, even if he has no special knowledge. A member of a Gas Association scarcely needs to be informed that the subject naturally divides itself into the consideration of mains, services, meters, and inside piping, or that the subject of mains may be further divided into low pressure and high pressure, or that when ordering special fittings it is well to send a sketch. No person capable of arranging a scheme of main-laying requires to be reminded that a sufficient quantity of lead and hemp must be provided, or that, where possible, the pipes should be unloaded with the socket end pointing the same way that the pipe is to be laid. Most people, in laying socket and spigot pipes, will insert the spigot of one pipe into the socket of another, and will see that the joint is clean. Nor does it seem necessary to explain that drip-pots are cylindrical vessels provided with hubs or bells of the proper size cast on opposite sides near the top. A considerable amount of information of this description might be cut out, in future editions, without injury to the character of the work.

The value of a book of this description, we opine, is chiefly as a source of information on particular points. A querist in a difficulty might be presumed to refer to it for information, before putting his needs into the form of an item for the Question Box. A good subject-matter index is therefore indispensable; but there is nothing in the way of an index or summary, so that the reader who wants to find out the usual weight of lead in a 6-inch joint, or a good cement for wrought iron, or preservative coating, might search the work from cover to cover before finding the particular requirement. The chief importance of the work, we take it, is not so much to furnish interesting reading for a leisure hour, as to enable the person who consults it to post himself up in the latest practice on such points as the quantity of lead to be used for a joint of particular size, the amount of fall considered necessary to keep the pipe drained; and many of the notes on these technical points are of such a wide character as to be of little use. The weight of lead used to run a 24-inch joint is stated, for example, as 24 to 50 lbs.; and there is a note to the effect that the larger quantity is nearer correct. The statement that the minimum extent of fall for mains is 2 inches, and for services 6 inches per 100 feet run, having passed the inspection of several experts, may be taken as correct, and as a good illustration of the useful information that might be looked for in a work of this character. The same may be said of the sectional sketch of an excavation with pipe in position, and the table of principal dimensions, that appear on pp. 16 and 17.

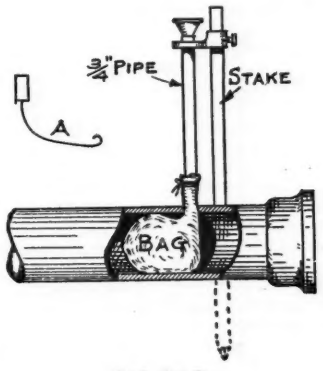
Size of Pipe. A.	B.	C.	D.	E.	F.	H.	J.
Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
3	22	22	22	8	8	18	6
4	22	22	22	8	8	18	8
6	22	22	24	8	8	20	8
8	24	22	26	8	8	20	10
10	26	22	28	8	10	20	10
12	28	24	32	10	10	26	10
16	32	28	42	14	12	32	10
20	36	32	58	18	12	36	12
24	44	36	66	20	12	38	12

English readers are likely to be interested in the paragraphs on lead *versus* cement joints, and the method of making cement joints, because the use of anything other than lead is, with them, the exception and not the rule. The arguments in favour of cement are worth consideration. For instance, it seems to be believed that cement joints can be made at one-fourth the cost of lead, and that they can be made absolutely tight. One lead joint in five to eight has been recommended to take care of expansion and contraction, and some suggest that this will take care of itself. The nature of the climate as affecting the changes of temperature to which the main would be exposed is the chief consideration in this connection. The paragraph on "Gas-Main Bags" comprises a large amount of useful, homely hints on a very important subject, and, like some others in the book, might well form the matter for a little leaflet to be given to main-layers, foremen, or others occupying responsible positions in connection with carrying out pipe-laying work. The sketch we reproduce



A. Size of Pipe. B. Width of Top of Trench. C. Width of Bottom of Trench. D. Width of Bell-Hole. E. Clearance at Side. F. Clearance at Bottom. H. Caulking Space. J. Bell Clearance.

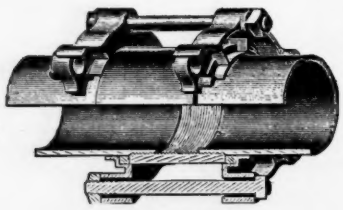
Sectional Sketch of an Excavation with Pipe in Position.



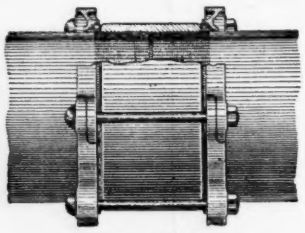
Cloth Gas Bag.

shows a bag made of cloth waterproofed by means of linseed oil, and kept charged with water under pressure by means of the rising pipe and funnel. It is stated that this form of bag can be inserted and the flow of gas stopped in 15 seconds, which would seem to indicate that it is a handy appliance in case of accidental fracture of a gas-main, when it is required to plug the pipe with the least possible delay.

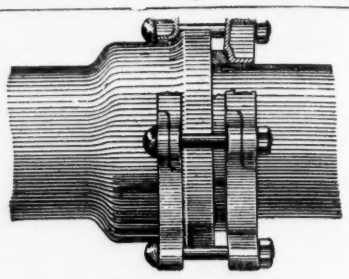
Of the various dopes used for the threads of wrought-iron pipe, preference is expressed for a mixture of two parts Portland cement to one of linseed oil. Wrought-iron pipe is recommended as being better than steel, as it is not so liable to corrosion, is softer and more easily tapped for connections, and more even in quality. A special make for this purpose is called "line" pipe; and it is 10 per cent. heavier than ordinary pipe. The threads are tapered, and the sockets longer than usual; so that the pipe can be screwed to the shoulder. In addition to the ordinary drip-pot or syphon, with upright pipe and connection for a pump, some attention is given to automatic or self-acting syphons, and sketches are given of two or three arrangements. An open seal or U pipe connected to a gas-main is objectionable as involving a certain amount of risk. With regard to high-pressure or trunk mains, it is remarked that, whereas at first these were applied for filling district holders, from which the gas was distributed as desired, the holder is now dispensed with—a regulating pressure-reducing arrangement being used instead, and the gas passed direct through it to the distributing system. As



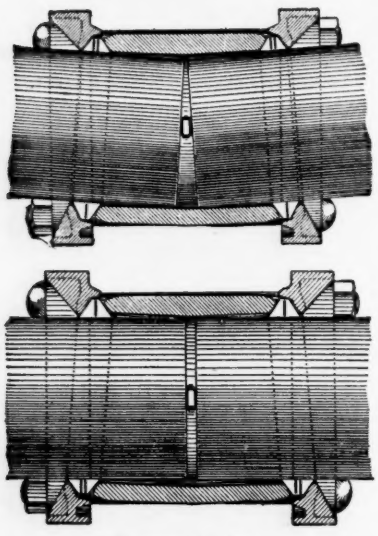
Dresser Leak-Clamp.



Hammon Leak-Clamp.



Another Form of Leak-Clamp.



Hammon Coupler.

a means of reinforcing any existing distribution systems, a high-pressure or "booster" line is recommended, carrying 5 to 15 lbs. pressure per square inch, maintained by a rotary blower or a compressor. Wrought-iron pipe is preferred for this purpose.

Long distance distribution can be dealt with in a similar manner. One advantage of the high-pressure system is claimed to be the absence of condensation, so that grading and a collecting vessel at the lowest point is unnecessary. There is a description of a device for use when making connections to high-pressure pipes, consisting of a combined saddle and T-piece and a mercury seal, and giving reference letters and other particulars of drawings. But the illustrations are not reproduced. "Natural gas long-distance lines" forms an extension of the subject. A remarkable feature in this connection is that the usual distribution practice is reversed. Instead of starting off with the largest sizes of pipe, and gradually reducing towards the extremities of the district, the smaller pipes are nearest the well; and at the outskirts, where the pressure is lower, they are larger. At the point of production, the pipe may be 6 inches in diameter, and subsequently enlarged to 8 inches, 10 inches, and even 12 inches. Valves are placed at the junctions and at intervals along the pipe line, so as to admit of any section being shut off if needed. Only two forms of couplings for these pipes are described—the Dresser and the Hammon; and their construction will be evident from the illustrations. The regulators used for reducing the pressure on the inlet to the distributing system are of the usual character, and comprise duplicate governors, with inlet, outlet, and bye-pass valves, also a safety seal-tank, with pipes of full bore, and an outlet carried to the outside of the building or to a convenient place; so that if the regulator should fail from any cause, the whole excess of gas would be carried off.

The usual methods of service laying are fully described, and the authors express a preference—if it is permissible to use such an expression—for a swing joint composed of a T-piece tapped into the main and an elbow screwed into the side branch of the T to take the branch. At the same time they are careful to state the objections to this arrangement; and it is a striking feature of the whole work that everything in the way of partisanship or preference for any particular method or appliance is studiously avoided—in some cases to such an extent as to make the reading flat and commonplace. The question of stopcocks at the curb is treated in a similar manner, from which it would appear that the swing joint and curb stopcock are not the exception in America, as they are in England.

(To be continued.)

Rural Water Supplies.—We have received from Dr. J. C. Thresh, the Medical Officer of Health to the Essex County Council, a copy of a paper on the above subject prepared by him for reading at a conference, held in London last Wednesday, of the Rural Housing and Sanitation Association, under whose auspices the paper is published.

MIDLAND JUNIOR GAS ASSOCIATION.

A Meeting of the Midland Junior Gas Engineering Association was held on Saturday, at the City of Birmingham Technical School—the PRESIDENT (Mr. G. W. G. Tatam) in the chair.

Mr. A. O. JONES (West Bromwich) read the following paper on

BENZOLIZED WATER GAS.

There are several methods of producing water gas *per se;* but up to the present, only one (the Dellwik plant) has been introduced into English gas-works—the first being installed at West Bromwich by Mr. Thomas Glover in 1901. Consequently, I propose to deal with this one alone. I shall not trouble you with a description of the plant, beyond saying it consists of a generator with top and bottom gas outlet-pipes, a scrubber for cooling the gas, a relief holder, and a meter; the purification and enrichment being done after admixture with the coal gas. The air-blast during the "blow" is delivered by a Roots blower; and steam during the "run" is supplied at 120 lbs. per square inch through a 1½-inch pipe fitted with a steam separator, which removes the condensed water from the steam.

THE BLOW.

In any process for making water gas alone, the aim of an ideal "blow" should be to liberate and retain in the generator a certain maximum amount of heat in the minimum of time, with the least expenditure of fuel. This is obtained by a high-velocity air-blast through a shallow fuel-bed, which ensures the maximum amount of CO_2 in the blast products, in accordance with the reaction $C + O_2 = CO_2$.

THE RUN.

On the other hand, the ideal during the "run" is to decompose the steam in such a way as to liberate, in a minimum of time, the maximum amount of water gas, in accordance with the reaction $H_2O + C = CO + H_2$. A high temperature is essential to formation of this ideal water gas; but a shallow fuel-bed will not decompose a large quantity of steam in a short time without partial formation of CO_2, as follows: $2H_2O + C = CO_2 + 2H_2$. Thus a shallow fuel-bed, which is economical during the "blow," is rather a disadvantage during the "run." Consequently, there is a certain depth of fuel in proportion to air-blast and steam supply which gives the best commercial result; for the absence of CO_2 in the gas produced is bought at a dear price if obtained at expense of fuel account and hourly producing-capacity of the plant. By a careful adjustment of conditions, the Dellwik process makes a practical compromise between these two ideals, and with what success you are now to judge.

IN THEORY.

In Appendix I. you will find theoretical yields of the first two reactions mentioned above, and also heat balance showing that 24 lbs. of carbon are consumed per 1000 cubic feet of water gas under ideal conditions—*i.e.*, with the "blow" according to reaction $C + O_2 = CO_2$, and the "run" according to reaction $H_2O + C = CO + H_2$.

Assuming 92 per cent. of carbon in coke, and 12 per cent. of heat lost by radiation, &c., we get 28·8 lbs. of coke per 1000 cubic feet of gas, or 77,777 cubic feet of gas per ton of coke, as the possible yield of gas at 60° Fahr. (= 73,580 feet at 32° Fahr.), which represents 86 per cent. of the heat in the coke.

IN PRACTICE.

The depth of fuel is maintained at about 4 ft. 6 in. by charging the generator with coke after every third "run." The "blow" lasts 60 or 70 seconds; the latter being after addition of charge. The air-blast is delivered at 12 inches net pressure in the generator; and the products of combustion are of fairly uniform composition throughout the "blow;" the result of tests made under ordinary working conditions being—16 to 17 per cent. CO_2; 2 to 3 per cent. CO; and trace of O.

During the "run," the percentage of CO_2 in the gas increases from *nil* at the beginning to 10 or 12 per cent. at the end of the sixth minute, when gas making is discontinued for another "blow." Hard cokes free from breeze give the best results.

The CO_2 in the crude gas is 5 to 6 per cent., which is rather high; but we get the largest yield of gas per ton of coke under these conditions, and work the generator well up to its guaranteed capacity of 20,000 cubic feet per hour, and often exceed it.

When the plant is at work throughout the day, and deduction

is made for coke removed from the generator when clinkering and cleaning, we can obtain 67,000 cubic feet of purified gas per ton of coke, or even more if the coke is dry and contains a low percentage of ash. But taking the above figure for regular work, it amounts to 72 per cent. of the heat in the coke.

Carbon Dioxide in the Crude Gas.

The action of undecomposed steam on CO was mentioned by Dr. Colman in the discussion on the paper read by our President (Mr. Tatam) last session—viz., $H_2O + CO = CO_2 + H_2$. Theoretically, this reaction is of great importance, inasmuch as 5 per cent. of undecomposed steam added to the equation $H_2O + C = CO + H_2$, would, if decomposed, result in the addition of 2½ per cent. of CO_2 (making the composition of the gas 46½ per cent. CO, 2½ per cent. CO_2, and 51 per cent. H, instead of 50 per cent. H, and 50 per cent. CO). This reaction is of no consequence after the gas has left the generator, as it does not take place below 1112° Fahr. (600° C.). And, apparently, at temperatures over 1750° Fahr. (950° C.) it is of minor importance, as Dr. Bunte's experiments (Appendix II.) show that, with as much as 27 per cent. undecomposed steam, only 6·8 per cent. of CO_2 is formed at that temperature. Undecomposed steam should be avoided, however, not only on account of CO_2 formed, but also because it is steam used unnecessarily, which carries away useful heat from the generator.

Increased length of "blow" reduces the amount of CO_2 in the crude gas to some extent; but it is questionable whether the reduction pays for extra fuel burnt. Increased depth of fuel, as previously mentioned, also reduces the amount of CO_2 formed during the "run;" but such increase is uneconomical during the "blow," both on account of increase of unburnt CO in the blast products, and because heat is absorbed in its (the CO) formation. This, however, could be remedied by an increase of the air-blast; but that is apt to blow pieces of coke out of the generator.

Superheating the steam was tried experimentally by passing the steam-pipe through the centre of the gas outlet-pipe from the generator. The effect of this was to raise the temperature of the generator and of the water gas formed, and consequently to increase the superheating of the steam. After a few runs, the gas outlet-pipe was raised to a dull red heat; and one or two of the fire-bars were melted, and let the coke through. Also, when the fire was drawn, the clinker was as hard as flint, and only dislodged with the greatest difficulty. A reduction of the steam supply, when tried, did not heat the generator to the same extent as superheating; but the make of gas per hour fell away to such an extent before a substantial reduction of CO_2 was obtained, that the increase of wages alone would have exceeded the saving in purification.

All things considered, it would appear that temperature is the chief thing; and this should be maintained high enough to keep the percentage of CO_2 in the gas within reasonable limits. Such temperature is probably between 1800° and 2000° Fahr. (972° and 1100° C.). Higher temperatures harden the clinker, shorten the life of the generator, and increase the heat lost by radiation and carried off by gases leaving the generator. For these reasons, I am inclined to believe that (provided the steam supply to the generator is not excessive) the waste heat from the generator is better utilized in heating feed water to boilers than in superheating the steam.

Working Results.

The following figures refer to five years' work, ending the 31st of March, 1906.

Cost per 1000 *Cubic Feet of Purified Blue Water Gas.*

	Pence.
Fuel (coke at 9s. 6d., breeze at 4s.)	2·32
Gas making, &c., wages	0·91
Carting fuel and removing refuse	0·16
Enrichment (to 17 candles)	6·09
Purification	0·64
Repairs and maintenance	0·45
Water, oil, waste, and other sundries	0·24
Total	10·81

Materials Used per 1000 *Cubic Feet of Purified Blue Water Gas.*

Coke to generator	36·93 lbs.
Breeze to boilers	20·44 ,,
Benzol used to enrich to 17 candles	0·63 gallon.
Purified blue water gas per ton of coke	60,637 c. ft.

The fuel result cannot be taken as representing the best obtainable, inasmuch as it includes all stand-by losses, and coke removed from the generator when cleaning (this latter being at times as much as 10 per cent. of the coke put into the generator). Taking the days when the plant was in use throughout the period, it works out to about one eight-hour shift per 24 hours. The boiler-fuel suffers most on this account; but, apart from this, the breeze used for this purpose is of poor quality, often containing 20 per cent. ash and 10 per cent. moisture, and rarely evaporates 4 lbs. of water per pound of fuel.

As a sidelight on the fuel account, it might be mentioned that the coke sales over this period amounted to 9·8 cwt. per ton of coal carbonized, and 3½ cwt. were used on the works for other purposes.

Cost per 1000 *Cubic Feet of Coal Gas during Same Period.*

	Pence.
Coal (less residuals) delivered and unloaded	4·10
Carbonizing, &c., wages	2·62
Fuel for heating retorts	1·58
Enrichment (to 17 candles)	0·71
Purification	0·63
Repairs and maintenance	2·46
Water, oil, waste, and other sundries	0·43
Total	12·53

The yield of coal gas alone was 11,077 cubic feet per ton of coal; the benzol used to enrich to 17 candles, 0·074 gallon per 1000 cubic feet of coal gas.

In comparing costs of coal gas and water gas, it should not be forgotten that a water-gas plant occupies only 25 per cent. of the space taken up by a coal-gas plant; and the capital charges are less by about 3d. per 1000 cubic feet.

In my opinion, the only disadvantage about benzolized water gas is that it reduces the calorific power of the coal gas when mixed with it; but that this is not very great, may be gathered from the following figures.

17-Candle Mixtures of Coal Gas and Benzolized Water Gas.

Proportions of Mixture.	Gross Calorific Power per Cubic Foot. B.Th.U.	Reduction of Calorific Power. Per Cent.
Coal gas alone	640	—
Coal gas 95 p. ct., benzolized W.G. 5 p. ct.	629	1·7
,, 90 ,, ,, 10 ,,	618	3·4
,, 85 ,, ,, 15 ,,	607	5·1
,, 80 ,, ,, 20 ,,	596	6·8
,, 75 ,, ,, 25 ,,	585	8·5
,, 70 ,, ,, 30 ,,	574	10·3

The flame temperature of the crude gas is theoretically 5370° Fahr. (2965° C.); and though actual tests are not available, yet platinum (melting point 3227° Fahr., 1775° C.) easily melts in the flame. Also, if blue water gas be burned in an argand burner fitted with a mantle, or an incandescent burner with the air-holes closed, it will give a more intense light than will an incandescent burner burning coal gas and air under ordinary conditions.

Enrichment.

The benzol used for enrichment is that known as 90 per cent. benzol, and has a specific gravity of ·882. The initial boiling point is 180° Fahr. (82° C.); and 90 per cent. distils over before 212° Fahr. (100° C.), and the remainder before 239° Fahr. (115° C.). A gallon of this 90 per cent. benzol will enrich 27,000 cubic feet of gas 1 candle. This proportion I find holds good for water gas mixed with coal gas up to 30 per cent. of the mixture; but when benzolized water gas is burned without admixture with coal gas, rather more is required to give the same result.

As regards permanency of benzol enrichment, it will be noticed from the table given in Appendix III. that gas will retain 0·419 gallon of benzene at 14° Fahr.—*i.e.*, 18° below freezing point—and as the vapour tension of benzol is about the same, it would appear that, theoretically, gas would retain far more benzol than would be required for any ordinary enrichment (for a mixture containing as much as 30 per cent. of water gas and 70 per cent. of coal gas would only require about 0·23 gallon per 1000 cubic feet to enrich it to 17 candles).

A comparison of tests made at the works and those made by the Gas Examiner in the town (1½ miles away), shows an average drop of 0·36 candle during two years ending March 31, 1904, which is not excessive. On the other hand, when the temperature falls below 28° Fahr. (4° below freezing point), it is found that some benzol is deposited in the holders; and the gas which was satisfactory at the holder inlet was sometimes as much as 1 candle less when it reached the station-governor outlet.

Experiments made last winter on gas containing 0·14 gallon of benzol per 1000 cubic feet, by passing it through U-tubes immersed in freezing mixtures, resulted in the following:—

28° to 32° Fahr.—Illuminating power not affected, and a small quantity of water, but no benzol, was deposited.

10° Fahr.—Illuminating power reduced 1¼ candles, 1·7 c.c. of benzol deposited from 10 cubic feet.

At present prices, benzol is cheaper than cannel for enrichment; and there is no doubt it is much more convenient and easily adjusted.

Appendix I.

$C + O_2 + N = CO_2 + N$.

12 lbs. C yields 44·0 lbs. CO_2 + 106 lbs. N.

1 lb. ,, 3·6 ,, + 8·8 ,,

,, ,, 21 p. ct. CO_2 + 79 p. ct. N. (by volume).

,, ,, 14,600 B.Th.U. liberated.

Of this amount of heat liberated, the blast products leaving the generator at 1300° Fahr. (700° C.) would carry off (3·6 × 0·216 + 8·8 × 0·244) × 1300 = 3800 B.Th.U., and some would be lost by radiation, &c.; but neglecting the latter, the available heat would be 14,600 − 3800 = 10,800 B.Th.U. per pound of carbon consumed.

$$H_2O + C = CO + H_2.$$
18 lbs. + 12 lbs. = 28 lbs. + 2 lbs.
= 378 cubic feet + 378 cubic feet

i.e., 12 lbs. of carbon yields 756 cubic feet of water gas at 60° Fahr. This is equivalent to 15·8 lbs. per 1000 cubic feet.

Assuming gas is made according to this reaction, we get—

	B.Th.U.
Heat brought to generator by steam at 120 lbs. = 18 × 1188 . =	21,384
Do., developed by combustion of C to CO = 4450 × 12 . . . =	53,400
Total	74,784
Heat absorbed in formation of H = 62,000 × 2	124,000
Do., by gases leaving generator at 1300° Fahr. (28 × 0·248 + 2 × 3·4) × 1300	17,868
	141,868
Therefore the excess of heat absorbed over heat developed, neglecting radiation = 141,868 − 74,784 . . . . . =	67,084

This is equal to 67,084 ÷ 12 = 5590 B.Th.U. required per pound of carbon used for gas making. This supplied by the first reaction during the "blow," would require 5590 ÷ 10,800 = say, 0·52 lb. of carbon per pound of carbon, or a total of 15·8 + (15·8 × 0·52) = 24 lbs. carbon required theoretically to produce 1000 cubic feet of ideal water gas.

Appendix II.

Table *giving Results of Dr. Bunte's Experiments to Determine Decomposition of Steam in Contact with Incandescent Carbon at Different Temperatures.*

—	Mean Temperature.		Percentage Composition by Volume of Water Gas Formed.			Steam Decomposed.	Steam Undecomposed.	Rate of Flow of the Gas. Cub. Ft. per Min.
	Deg. F.	Deg. C.	H.	CO.	CO_2.	Per Cent.	Per Cent.	
1	1245	674	65·2	4·9	29·8	8·8	91·2	1·91
2	1396	758	65·2	7·8	27·0	25·3	74·7	3·91
3	1540	838	62·4	13·1	24·5	34·7	65·3	7·76
4	1540	838	61·9	15·1	22·9	41·0	59·0	6·95
5	1582	861	59·9	18·1	21·9	48·2	51·8	11·24
6	1750	954	53·3	39·3	6 8	70·2	27·2	13·35
7	1850	1010	48·8	49·7	1·5	94·0	6·0	13·04
8	1940	1060	50·7	48·0	1·3	93·0	7 0	20·77
9	2060	1125	50·9	48·5	0·6	99·4	0·6	23·95

Appendix III.

Table *originally Published by Dr. Bunte in* "Journal of Gas Lighting," *Oct.* 17, 1893.

[Last two columns added by Mr. Thomas Holgate.]

Temperatures.		Vapour Tension in Millimetres of Mercury.	Percentage of Vapour by Volume.	Grammes of Benzene in One Cubic Metre of Gas.	Grains of Vapour per Cubic Foot of Gas.	Gallons of Benzene per 1000 Cubic Feet of Gas.
Deg. F.	Deg. C.					
5	−15	8·82	1·17	40·4	17·65	0·286
14	− 10	12·92	1·70	59·3	25·91	0·419
23	− 5	18·33	2·41	84·0	36·70	0·594
32	0	25·31	3·33	116·1	50·73	0·821
41	5	34·17	4·49	156·5	68·39	1·107
50	10	45·25	5·95	207·5	90·67	1·468
59	15	58·93	7·75	270·2	118·07	1·911
68	20	75·65	9·95	346·9	151·59	2·461
77	25	95·91	12·62	440·0	192·28	3·121
86	30	120·00	15·80	550·9	240·74	3·908

Discussion.

The President said he was sure that the members had all heard the paper with great interest, and were pleased to have Mr. Copp with them, seeing that he had kindly allowed his Assistant, Mr. Jones, to describe the plant in use at West Bromwich. They would be very glad to have any information Mr. Copp could give them. Of course, there were many methods of enrichment; and it was a much debated point now as to which was the best. No doubt Mr. Copp, from his great experience, could give them some very reliable data.

Mr. H. E. Copp (West Bromwich) said it was true that he had the honour of working what was, he believed, the first blue water-gas plant in this country; and he must confess that at the time he did not much relish the honour, as the difficulties presented seemed to be very great. If he might be permitted to digress just a little from what was strictly speaking the subject of the paper, it might be interesting to the members to know what these difficulties consisted of. In the first place, the water gas was produced and put into a very small relief holder, and was from there delivered straight into the foul main. Well, they found that immediately the plant was started the make of coal gas dropped off—and dropped off to a very serious extent. They had to look round and see what was the cause of this; and he came to the conclusion then—and this conclusion had since been borne out—that it was due to mixing a volume of cold water gas with hot coal gas. For a physical reason which he could not explain, and which he had never heard satisfactorily explained, it caused a sudden precipitation of the various constituents of the coal gas; and this, of course, affected the illuminating power. They had put the water gas in at every point, from the retorts to the gasholder almost; and as the result of all these experiments, they were now heating the gas up to perhaps 180°, and putting it in at the condensers, where they thought it could not do any harm. The reason for heating it up was that if it was cold perhaps some of the benzols and light hydrocarbons might be deposited. They found that they obtained greatly improved results when the water gas was heated. Passing on to the paper, Mr. Jones gave the reaction for the "blow" as $C + O_2 = CO_2$. This was beautifully simple; but, of course, they knew that the reactions taking place in the generator were not quite so simple as they appeared to be on the face. In the first place, the CO_2 had a most important bearing on the question in this way: When the blast was put into the hot fuel, CO_2 was immediately formed. If the fire was hot enough in the upper strata, and the fuel was sufficiently thick, they got a second reaction $CO_2 + C = 2\ CO$. This was very important, because, as Mr. Jones said, the depth of the fuel in proportion to the blast was what had to be considered. Mr. Jones gave 12 per cent. of heat lost by radiation. He (Mr. Copp) had not had time to go into the question; but, of course, another source of great loss was the heat of the gas passing away from the generator. This took with it a large number of heat units. Perhaps Mr. Jones could give them some explanation on this point. As to the question of the air-blast, this was the *crux* of the whole thing, so far as the Dellwik system was concerned. Mr. Jones said it was delivered at 12 inches net pressure in the generator. He thought Mr. Jones should have said that the blower at West Bromwich was capable of delivering so many cubic feet per minute. It was a Roots blower; and, of course, the idea of having this instead of a Sturtevant blower was that, no matter what the resistance might be, one got a given quantity of air through the generator. Thus the amount of air actually passing through the generator was constant in the Dellwik process; whereas in the Lowe it depended on the resistance of the generator. Of course, the same thing was true to some extent with the Roots blower; but in a much smaller degree. Mr. Jones stated that the products of combustion were of fairly uniform composition throughout the "blow;" but he (Mr. Copp) was afraid that he could not agree with this. Of course, when the blast was put on, the temperature was fairly low in the generator. It was a very powerful blast, and increased the temperature very rapidly; and as the temperature rose, the carbon monoxide was incidentally increased. So that at the end of the "blow," if it lasted 50 seconds they did not see much flame at the top of the generator, but if it lasted 80 seconds they would have a very high percentage of carbon monoxide in the chimney gas. Mr. Jones said—"5 to 6 per cent., which is rather high; but we get the largest yield of gas per ton of coke under these conditions, and work the generator well up to its guaranteed capacity of 20,000 cubic feet per hour, and often exceed it." He (Mr. Copp) would rather he put, instead of the "largest yield of gas," the "largest yield of combustible constituents." Then as to superheating the steam. This was a point on which they had made a number of experiments. Of course, one of the first things that would occur to them was that, if they superheated the steam with waste heat from the plant, they were more or less making it a recuperative process; but the difficulty was a physical one—the fire-bars melted. He only wished they could heat the steam without melting the fire-bars. They had a centrifugal steam-drier at present; but he thought a way almost as effective would be to have a constriction of the steam-pipe, and immediately after that deliver the steam into a pipe of rather larger diameter. In this way, by lowering the pressure, they would absorb the precipitated water. It would be noticed that Mr. Jones's table of the cost of production gave an average of five years' working; and he would like to point out that their methods of keeping costs at West Bromwich precluded, he thought, any chance of error creeping into such a table. They had a book the extent of which he felt sure, if the members saw it, would rather surprise them. It gave every particular relating to cost of production. It was not theoretical, but absolutely the actual cost. Purification was entirely by lime; so that they got out the whole of the CO_2, and such small quantity of sulphuretted hydrogen as there was in the gas; it was a very trifling amount, he thought only about 0·5 per cent. This purification item was the only one on which perhaps some doubt might arise in the minds of the members. They had only one set of purifiers, through which both the coal gas and water gas had to go; and they found in practice that since they had the water gas—even when large quantities were going through—the purification did not alter. So that they were fairly justified in debiting the water gas with that cost for purification. The question of the capital charges which Mr. Jones referred to was a very debatable point. He (Mr. Copp) thought it would be better if, instead of saying that capital charges were reduced by about 3d. per 1000 cubic feet, it was put in this way: You have got to the limit of your output; and you want an extension. You go into the question, and see how much it would cost to increase your plant by a certain make per day with coal gas; and then you go into the matter of water gas, and see how much that would cost you. He believed Mr. Jones's figure was about right; but it looked a good deal. Of course, if they wanted to increase their output, and they came to the conclusion that the purifiers would be big enough, they would

not include this in their estimate. The table giving particulars of the drop in calorific power was very interesting; but he wished the calorific power of the water gas had been added. They had made numberless tests, and found very little variation in the calorific power of the blue water gas. It was about 320 B.Th.U. per cubic foot gross, and 290 B.Th.U. net; and the amount of benzol necessary for raising the illuminating power of the gas to 17 candles, imparted an additional calorific power to the gas of something like 80 or 90 B.Th.U.

Mr. JONES: About 100 B.Th.U.

Mr. COPP (continuing) said that another interesting point was with reference to the excellent light obtainable from blue water gas in incandescent burners with the air-holes closed. Of course, slightly more gas was used—perhaps 15 or 20 per cent. more gas was necessary to fill a mantle; but when the mantle was filled, no doubt the incandescence was very much higher. As Mr. Jones said, they calculated the theoretical flame temperature; but it was impossible to get the actual figure, because they could not tell the specific heats of gas at this high temperature. With a big percentage of blue water gas, of course, there was the difficulty of adjustment, owing to the smaller quantity of air required for the combustion of the mixture. Here came in the necessity for such a testing burner as Mr. Carpenter's, in which the air was capable of being adjusted in order to get the maximum efficiency. Of course, this was perfectly legitimate, because nearly every incandescent burner had an adjuster, so it was quite possible to secure the same conditions in practice. The table in Appendix III. would well repay careful study. It was a very long time indeed since the experiments were made; and another point was that Dr. Bunte's figures were secured with pure benzene, which was very different from 90 per cent. benzol. The way in which the benzol vapour was mixed with the gas was important. He had tried experiments with different forms of carburettors; and he was sure there was a great deal more in this than was generally imagined. Then Mr. Jones told them how much benzol they ought to use, and how much condensation they ought to expect; but there was another factor, the mechanical factor—the question of the friction of the gas against the sides of the pipes. This to his mind had a greater effect on condensation than—or almost as great an effect as—temperature. Of course, within ordinary temperatures, such as were experienced in England, there ought to be no condensation; and, as a matter of fact, except in very cold weather, they did not get much.

Mr. C. H. CARDER (Tipton), who said he had experience of what he believed was the second plant put up in England, disagreed with the length of "blow" stated in the paper. A minute was enough for an ordinary "blow;" but after charging up with coke they found at Tipton that 70 seconds was not sufficient, and that 90 seconds was best, with a nine-minutes run. No doubt, however, every plant had its idiosyncrasies. They had not a steam superheater at Tipton, but what Mr. Jones recommended—a feed-water heater. But there was a difficulty with this, as the alternate expansion and contraction loosened the joints; and no matter how often the tubes were attended to, they were found weeping, and the dust carried over from the generator caused trouble. He was afraid the coke, at 9s. 6d. per ton, was charged at too low a rate. The average contract price should be taken; and this, unless he was much mistaken, would be about 1s. a ton higher. With regard to materials used per 1000 cubic feet, they got better results at West Bromwich than were secured at Tipton; but he thought the chief difference was that in the former place the plant was worked regularly, whereas at Tipton it often stood idle for days—it was used more as a stand-by, and not as part of the regular plant, as was the case at West Bromwich. Mr. Jones very kindly gave them the calorific values of different mixtures; but he did not say anything about the effect on gas-engines. Of course, a 30 per cent. proportion of water gas was theoretically very desirable; but the users of gas-engines could not alter their valves to suit whatever mixture might happen to be supplied to them for the time being, and they had found that about 15 per cent. interfered seriously with the power given by those engines which were working up to their full capacity. The quantity of blue water gas required per horse-power-hour was 30 cubic feet; while with coal gas it was 16 or 17 feet.

Mr. W. E. CATON (Derby), referring to the item of purification, remarked that he had made a note of this, as to his mind it seemed rather excessive to charge the coal gas the same rate as the other. Mr. Copp's explanation tended to clear this up; but still he thought the water gas would cost more than the coal gas. Then Mr. Jones did not say whether the plant was regularly worked up to its full capacity. If the make was varied from one day to another, the calorific power would be altered; and this would affect the engines and stoves. In the table of the cost of coal gas, Mr. Jones gave 4·1d. for coal (less residuals) delivered and unloaded. This was rather higher than at Derby; but no doubt it was about the average for West Bromwich. Then he gave fuel for heating retorts as 1·58d. Surely this was included in the coal, unless he bought something cheap for heating the retorts. The calorific power of the coal gas seemed rather high; he thought an average of 600 B.Th.U. would be very fair. As to the depositing of benzol, he did not find that it carried so well as Mr. Jones said. The cost of repairs and maintenance in the case of coal gas was put at 2·46d., and in that of water gas at 0·45d. Twopence seemed rather a big variation between the repairs and maintenance of the retorts and of the generators; and the difference could only be in the retort-house and generator-house, as he presumed the water gas passed through the whole of the other plant.

Mr. S. T. SMITH (Walsall), alluding to the statement that the water gas was put into the coal gas at the condensers, asked whether Mr. Jones had noticed that it had any effect on the coal gas at that point. He would also like to have an analysis of the mixed gases. Then what effect had the water gas on the tar during the condensing and washing processes? What difference was there in the constitution of the tar after the water gas had been added and the coal-gas tar? In the working results, the purification cost was given at 0·64d. with 5 to 6 per cent. of CO_2. Mr. Jones had not stated the percentage of sulphuretted hydrogen in the water gas; but the CO_2 percentage was very high. One could almost reckon it as double the CO_2 in coal gas, with the same cost of purification. This appeared to him to put the coal gas high or the water gas low. He presumed that the total cost was per 1000 cubic feet made, not sold. As regarded Mr. Carder's remarks, he should hardly have expected the difficulty he mentioned as occurring with the engines. Of course, with producer gas engines did require a different mixture; but then this was only about 150 B.Th.U., and one would therefore naturally anticipate some alteration. The figure of 574 B.Th.U., which Mr. Jones gave for 70 per cent. coal gas and 30 per cent. benzolized water gas, was, however, as much as lots of coal gas at the present day came up to; and he should hardly think the trouble was so real as Mr. Carder said.

Mr. CARDER remarked that about 17 cubic feet of a pure coal gas of an average value of 620 to 640 B.Th.U. was required per brake-horse-power-hour; while a 25 per cent. mixture of water gas would need 21 cubic feet with an engine working up to its full capacity. The valves would not, of course, pass any more gas, and thus the trouble occurred.

Mr. J. H. DARRAH (Nechells) said he could not quite understand the fire-bars melting through superheating the steam. He thought it must be the blast that caused the mischief, and not the steam. In his opinion, the statement that a gallon of 90 per cent. benzol would enrich 27,000 cubic feet of gas 1 candle needed some qualification. It was a distinctly higher figure than he had believed possible. Was the testing carried out simultaneously by the examiner and at the works? An average drop of 0·36 candle was very good for a distance of 1½ miles. As to Mr. Copp's remark about the make of coal gas dropping when the water gas was added, he did not think this was so much a matter of physical law as areas of the pipes or the exhauster. One thing which was rather outside the paper but which he would like to know was whether Mr. Jones had noticed that the process had any influence on naphthalene. Had there been fewer complaints since the starting of the system? He could not say he was greatly in favour of any process relying upon benzol; but he thought the strongest argument for this gas was the flame temperature, which was certainly now very important owing to the strides made by incandescent lighting.

The HON. SECRETARY (Mr. J. Hewett) said their thanks were due to Mr. Jones for the valuable figures he had given—valuable because they were practical. No doubt they were figures that had been obtained at West Bromwich. The first point in the working cost would be that of fuel; and coke at 9s. 6d. a ton had a great bearing on this. Even if they put the cost at 12s. per ton for the coke and 5s. for the breeze—and he took it they obtained quite this average price for coke at West Bromwich—it would increase the cost of the blue water gas by ¾d., and at the same time affect the residuals item in the coal gas costs. Thus the cost of manufacture in both cases would be the same. As to purification, he noticed the cost was 1d. per 1000 feet in 1903-4 and 1904-5, so he hardly thought there would have been such a difference as shown by Mr. Jones. Of course, they were all agreed that the introduction of water-gas plants was most desirable, for with them it was possible to pick up an abnormal demand for gas; the difference of opinion arose with regard to the system to be adopted. Some time back, he had read of experiments at Güstrow; and there it was decided that there was no advantage whatever in admitting the water gas at any point except in the retort. This was borne out by results at another town, where there was a gain of 18 per cent. in illumination by introducing the gas in the retorts, but no advantage otherwise. What was the cost of the benzol? From the figures, it appeared to be about 9·6d. per gallon.

Mr. P. C. BALCON (Swan Village) said he thought the item of coke to generator 36·93 lbs. per 1000 cubic feet of purified blue water gas was rather high. He asked whether, taking the figures for a carburetted water-gas plant at about 32 lbs. of coke, something like 3 gallons of oil per 1000 feet of gas, and an illuminating power of 20 to 21 candles, these compared favourably with the Dellwik plant. He should think they would.

The PRESIDENT remarked that there had been much discussion regarding the "blow." He thought that, as the Dellwik plant was designed to give a better distribution of blast in the generator, they should certainly get better results than 5 to 6 per cent. of CO_2 in the finished gas. He knew himself a water-gas plant of the Humphreys and Glasgow type, with which they were well able to keep down to a maximum of 4 per cent.; and the average, week in and week out, never exceeded 3·5 per cent. These tests were taken every hour throughout the twenty-four. They had three plants at work, and there were hourly samples collected from the crude gas for analysis. He could not agree

with Mr. Jones that when the generator was being run under such conditions as to give 5 to 6 per cent. of CO_2 in crude gas, they were going to obtain the largest yield of gas per ton of coke. It was usually found that the best possible value was derived from the coke when the steam and depth of fuel in the generator were so adjusted as to reduce the CO_2 to (say) 3·5 per cent. Mr. Jones said that, with excessive "blowing," as the temperature rose so did the CO. This, of course, one would expect; and, in fact, the only way to overcome the difficulty of the CO increasing in the "blow" gases as the fuel got hotter was to increase the volume of air going in, because, as they knew, the reaction $CO_2 + C = 2CO$ was not governed simply by the heat of the mass of carbon. The lower the heat, the larger was the quantity of CO_2 produced. He could quite appreciate Mr. Jones's trouble when they tried superheating, because he himself had had experience of a similar difficulty. As to the statement that "a reduction of the steam supply, when tried, did not heat the generator to the same extent as superheating, but the make of gas per hour fell away," it seemed to him to be rather the reverse of general experience with regard to limiting the steam supply. He thought there was something which caused this apparent falling off of the make, other than the reduction of the steam. When they came to consider the calorific value of gases—a point which had been raised by several speakers—it was not so much a question of the calorific value of the gas itself, but of the mixture of gas with air. If the gas needed a lot of air, there was a large expenditure of heat-energy required to heat the air to the temperature at which the gas was burning. The smaller the quantity of air, the smaller the quantity of heat that was taken away from the flame in order to raise the air to the required temperature. If they took even poor producer gases, the smaller quantity of air required for combustion raised the temperature of the mixture—that was, the flame temperature—very much above that of even good calorific power coal gas; and this was the reason why it was so beneficial for incandescent lighting. He did not quite follow, from a theoretical standpoint, why the water gas should have such a bad effect on engines; and he thought the general knowledge on the subject rather favoured Mr. Smith's idea that a small admixture of water gas had very little effect on the power of gas-engines. As to the position in which the water gas was put into the plant, Mr. Copp explained that this was done at the inlet of the condensers. Mr. Hewett had reminded them that a lot of work had been done in Germany; but he (the President) was under the impression that the deduction made from these experiments was that there was very little difference between the effect of water gas in the retort and in the hydraulic main. At any rate, it seemed to him that the hydraulic main was almost as good a place as the retort. In the hydraulic main it came into contact with gas loaded with volatile hydrocarbons; and it was in a fine position for saturating itself to the same extent as the coal gas with the light oil vapours. Of course, if it was put in at the condensers, there was still hot gas there; and if it was heated to 180°, it should absorb quite as much as in the hydraulic main. Mr. Smith asked if Mr. Jones had noticed any effect on the composition of the tar due to putting the water gas in at the condensers. As the author said they only worked the plant eight hours out of twenty-four, he (the President) did not think there would be any great difference. Of course, there must be some difference in the quantity of light oils. He would like to know the conditions of testing at West Bromwich. As to enrichers, it had been his experience that, whether one used benzol or carburine, or anything else of that kind, the difficulty was in getting the gas thoroughly mixed. Physically, gases should mix thoroughly in the holders; but coal gas did not—stratification went on. He had often wondered why, when carburetting, the whole of the make was not passed through the apparatus, instead of, as in many cases, a portion being bye-passed. Unless all was carburetted, the mixture was not satisfactory. The experiment made by Mr. Jones of passing the gas through a U-tube immersed in a freezing mixture was very interesting. He had himself carried out the same experiment, but not with the same success, because he had found depositions at the freezing-point of water, although at that temperature the gas was theoretically unsaturated. He concluded by proposing that Mr. Jones be accorded a hearty vote of thanks for his paper, and that he be asked to convey to Mr. Copp (who had left the meeting) the thanks of the members for the additions he had made.

Mr. J. H. Willoughby (Leamington), in seconding the proposition, asked whether, with a mixture of 30 per cent. of water gas and 70 per cent. of coal gas in the gasholder for several days, the illuminating power would be decreased, or the enrichment that had been added would remain good.

The vote of thanks having been carried by acclamation,

Mr. Jones replied at considerable length to the discussion. In the course of his remarks, he said it was not necessary to use benzol for enrichment with the Dellwik system; there were other methods. At Cleethorpes, they used the Peebles process in connection with it. Mr. Copp had mentioned that it would have been better if he had stated the amount of air for the blast delivered in one minute. This was an important point; and he might say that the blower was rated to deliver 8300 feet per minute. Mr. Copp did not agree with him as to the composition of the products of combustion; but what was stated was the result of tests. It was quite right that if they continued to "blow" they would get an increase of CO; but they cut the "blow" down as soon as this began to happen. Regarding the sulphuretted hydrogen in the water gas, there was not so much as in coal gas, where they had 1 per cent. or more. As to capital charges, their plant was not entirely independent, so that he could not really give the figure without estimating. He therefore took the figure of 3d. per 1000 cubic feet, which was usual in connection with carburetted water gas. The calorific power of the water gas was about 320 B.Th.U., and the benzol added another 100 B.Th.U., making the benzolized water gas 420 B.Th.U. gross. Mr. Carder thought the length of the "blow" was not sufficient; but at Tipton they might have a different depth of fuel. At West Bromwich they used a fairly low depth of fuel, to keep the CO_2 down; and if Mr. Carder used deeper fuel, he would require to "blow" longer. Before Mr. Carder's remarks as to the feed-water heater, he (Mr. Jones) thought it was a very good idea; but he would have to reconsider it now. The price he quoted for coke—9s. 6d.—was based, he believed, on the lowest contract figure; and that used for firing retorts during the same time was charged at 9s. 4d., so that he had not gone out of his way to put the price down. They only mixed about 15 per cent. of water gas as their maximum; whereas they would see from the figures that even with 20 per cent. there was merely a reduction down to 600 B.Th.U. They had a "National" gas-engine for operating their stoking machinery, which was driven by crude water gas alone, so that there was no difficulty about running a gas-engine with water gas. As the President said, it was a matter of air supply. Mr. Caton was surprised that the purification did not cost more. Well, his paper contained their actual experience. They found very little increase in the lime used. He thought over the whole period the lime only amounted to 5·25 lbs. per 1000 cubic feet of mixed gas. He attributed this to the smaller amount of sulphuretted hydrogen to be extracted than with coal gas. He mentioned the fuel for heating the retorts, because this figure was included in the residuals as well. The calorific power given for the coal gas was their average; sometimes it was higher. A few days ago their make was something like 10,800 or 10,900 cubic feet, and they got up to 660 B.Th.U. for coal gas alone. The candle power was about 16 for 640 B.Th.U. The item of repairs in the coal gas costs was no doubt influenced by special expenditure during the period dealt with. The only difference made to the tar by putting the water gas in at the condensers was that they had rather more water in it than formerly. The costs were per 1000 cubic feet made; but there would not be a great deal of difference between that and the gas sold, as the leakage was only about $3\frac{3}{4}$ per cent. over the period. The benzol was added at the inlet of the station meter. Mr. Darrah was surprised to hear they enriched 27,000 cubic feet of gas 1 candle with a gallon of benzol; but this was not at all out of the way. The examiner in the town took his tests when he liked; whereas the tests at the works were carried out every day, and sometimes twice a day. They did not find that the benzol acted as a naphthalene extractor as well as an enricher. The difference in purification figures pointed out by Mr. Hewett was due to the fact that the higher one included "sundries." The effect of adding water gas to coal gas was very much a matter of the heats they carbonized at. Carbonizing at high temperatures, and getting as much gas as possible, they would get very little additional enrichment; but if they carbonized at a low temperature, and had a lot of light oils, it was quite possible that they might get additional enrichment. The cost of the benzol was about 9½d.; and the average cost of enrichment included a man attending to the carburettor. Mr. Balcon had referred to 20-candle carburetted water gas; but in order to get this he had to add about 3 gallons of oil at (say) 3d. per gallon, which was 9d. straight away for enrichment. It was a question of price. If they took the enriching power of carburetted water-gas oil, it was about 7 candles per gallon.

The President said 3 gallons for 20 candles was rather high. He could give records of 2·75 gallons.

Mr. Jones maintained that 7 candles per gallon was a good working figure. Continuing, he said the President had remarked that 5 to 6 per cent. of CO_2 in the gas was high, and compared it with 3·5 per cent. in the case of carburetted water gas. The difference was easily explained, because with the carburetted water-gas generator there was a greater depth of fuel.

The President: It is under 6 feet generally.

Mr. Jones said in that case there was not much difference. But the depth of fuel was the essential distinction between the Dellwik generator and the Lowe apparatus. The President also implied that because they had a large percentage of CO_2 they necessarily had a small make per ton of coke; but if they made gas according to the other reaction, they got $2H_2O + C = CO_2 + 2H_2$. That was, if they got a maximum amount of CO_2 in the crude water gas, they obtained a larger volume; so that if they subtracted the CO_2 from that, they still had as much gas per ton of coke as in the other reaction, with this difference—that they got 50 per cent. CO and 50 per cent. H, whereas in the other case they had nothing but hydrogen. Of course, the CO_2 was taken out in purification. For testing they used a 16-candle standard argand and a 10-candle pentane lamp. They did not find that storing the benzolized gas had any lessening effect on the illuminating power, except in cold weather. In his experiments for deposition, the President perhaps used a larger quantity of benzol. He (Mr. Jones) mentioned that the amount he used was only 0·14 gallon per 1000 cubic feet. With a larger quantity there would, of course, be more deposit.

REGISTER OF PATENTS.

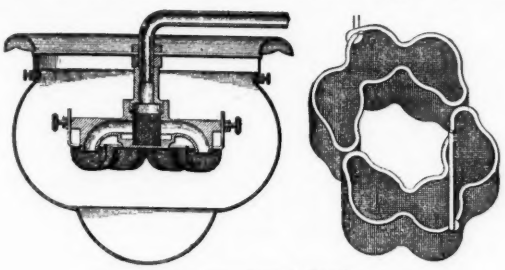
Mantles for Incandescent Gas-Lamps.

CLARK, D. J., of Jersey City, U.S.A.

No. 24,522; Nov. 27, 1905.

This incandescent mantle comprises a plurality of hollow sections placed together to form a ring, "whereby the illuminating surface of a single mantle is increased; and if one of the sections becomes burnt out or broken, it may be removed and replaced by a new section—thus effecting a great saving of the mantles."

The illustration shows a burner-head connected with the gas supply by a pipe, and comprising a casting embodying a central chamber, a reticulated cap therein, and downwardly extending radiating burners leading from the chamber. To provide means for supporting a mantle-



Clark's Incandescent Mantle.

hanger and mantle (to be described) in the proper relation to the burners, bosses are formed on the burners, and each is provided with a vertical bore intersected by a horizontal screw-threaded bore engaged by a set-screw.

The hanger employed for supporting the mantle comprises independent frames, each formed of a single piece of wire bent to present a horizontal portion, having large openings connected by narrow passages and a vertically extending portion adapted to be inserted into one of the bores in the burner, and be secured therein by a set-screw. The mantle comprises independent hollow curved sections substantially U shaped in cross section, and having pockets into which the burners project, connected by narrow passages. By this arrangement, each flame of the burner will, it is said, be partially confined within a pocket of the mantle.

Production of Permanent Gas.

DIBDIN, W. J., and WOLTERECK, H. C., of Victoria Street, S.W.

No. 26,666; Dec. 21, 1905.

The specification of this invention (which is not illustrated) states the claim for it to be the process described for the production of permanent illuminating and heating gas from hydrocarbons and steam, by passing a mixture of finely-divided hydrocarbons and superheated steam over a highly-heated contact material consisting of protoperoxide of iron containing free protoxide.

It is known, the patentees point out, that on passing a mixture of superheated steam and hydrocarbons, finely divided, over highly heated metals, decomposition of the steam and simultaneous disintegration of the hydrocarbons take place. The gas obtained has, however, the great disadvantage that it quickly loses part of its hydrocarbons by condensation. This is caused mainly by the disintegration of the hydrocarbon molecule not proceeding sufficiently far. It has been tried to remove this disadvantage by causing the reaction to take place at a white heat. These attempts, however, did not succeed, as carbon was separated in its elementary form accompanied by corresponding loss of hydrocarbons. For this reason, the reaction has, in practice, only been employed for the production of gases of high illuminating power in correspondingly small quantity, which was used for the carburation of gases of low illuminating power. All attempts to employ the reaction for the production of a gas as a substitute for ordinary illuminating gas have failed up to the present time.

Even if the mixture of superheated steam and hydrocarbon vapours acted at first on metal, the latter under the action of the steam is quickly changed into its oxide—especially in the case of iron, which, by the carbon monoxide and hydrogen generated by the reactions, is reduced again to metal. This regeneration of metal appears, however, to be a disadvantage for the success of the gas-producing process; in fact, they say they have found that complete disintegration of the hydrocarbon molecule, and consequent formation of permanent gases—*i.e.*, gases not losing by condensation in illuminating or calorific power—takes place only if this theoretically easily explained regeneration of metal by reduction be excluded.

According to their present invention, the reduction of the metal oxide to metal by the gases generated by the reaction (such as carbon monoxide or hydrogen) is, as far as possible, prevented; and the steam and hydrocarbon act on the protoperoxide of a metal—as such the protoperoxide of iron has proved especially successful. It cannot be quite fully explained why the protoperoxide of iron should act better, as has been found to be the case, than the proto or peroxide alone; but it may be that the reduction of the metal oxygen compound only proceeds to the formation of protoxide. This appears so much more probable, as the material adapted for the action of the mixture of steam and hydrocarbons acts best if it consists of a protoperoxide of iron containing free protoxide of iron.

It must be left undecided what chemical transformations take place in this reaction. Indeed, it does not seem impossible that only catalytic action takes place. But as to this, having regard to the present state of scientific knowledge as to catalytic action, no certain view can be advisedly expressed. However, the protoperoxide of iron, as used in the present process, consists of a very porous material, which, when heated, is able to absorb large quantities of gas like a sponge, and accordingly may, in fact, act only as a catalytic agent. Whether it does or not, for the purposes of the present specification, they refer to this material as contact material.

Their process for the production of permanent gases, then, consists in passing a mixture of hydrocarbons (paraffin) and superheated steam in finest division at high temperature (bright orange) over a porous, spongy contact material consisting principally of protoperoxide of iron, or preferably of protoperoxide of iron containing free protoxide. This contact material may be prepared in different ways. The method preferred consists in passing steam and an excess of hydrocarbons through an iron or steel retort filled with thin iron tubes. The retort and its contents are heated to bright red heat; and the steam and hydrocarbons are passed through the retort for several days—until an examination of the contents of the retort shows that no trace of metallic iron remains in the thin tubes filling the retorts. This may be ascertained in a simple manner by trying to break the end of one of the tubes. In case the iron has been completely oxidized, the material will be brittle like glass—breaking easily. The oxidized material, on cooling, shows a fine crystalline structure. Its analysis showed that it consists of nearly equal parts of ferrous (proto-) and ferric (per-) oxide and contains no trace of carbon. A contact material suitable for this process should contain at least as much protoxide as peroxide; and the quantity of the latter in no case should exceed that of the former. It appears even of advantage if the material contains ferrous oxide in excess—thus consisting of protoperoxide of iron containing free protoxide.

With retorts prepared in this manner, the decomposition of hydrocarbons may be proceeded with continuously for a long time; but the proportion of hydrocarbons and steam should be maintained fairly constant, and the reduction of the contact material be prevented from proceeding too far.

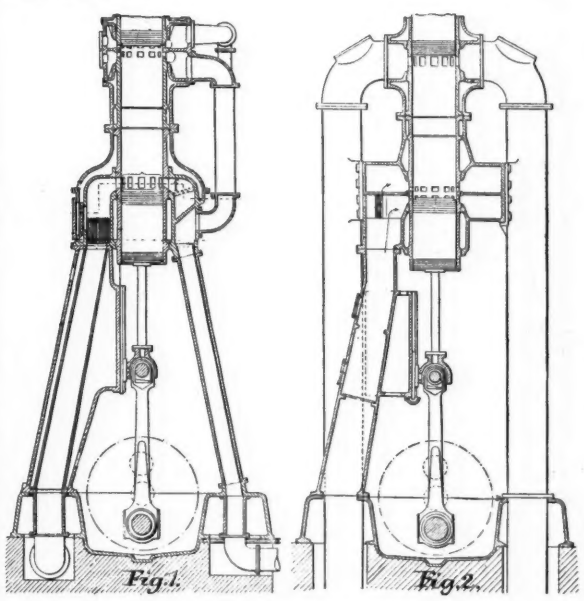
For the production of gas of 16-candle power, the proportion of hydrocarbons to steam is maintained at about 1 to 10. A ton of crude petroleum will produce about 100,000 cubic feet of gas of 16-candle power, consisting principally of hydrogen, luminous constituents of the methane and ethylene series, small quantities of carbon monoxide, and a little carbonic acid, which latter may be removed in the usual manner. It possesses consequently the character of ordinary illuminating gas.

Vertical Gas-Engines.

OECHELHAEUSER, W. VON., of Dessau, Germany.

No. 1575; Jan. 20, 1906.

This invention relates to vertical two-stroke-cycle gas-engines with pistons controlling rings of slot-ports, wherein, during the short time which is available in such engines for the discharge of large quantities of burnt gases and for the scavenging with fresh air, the discharge from the power cylinder and its scavenging and charging are effected "in the shortest way, and with the least possible resistance and consumption of power."



Oechelhaeuser's Vertical Gas-Engine.

The essential feature of the invention consists in the fact that the supporting frame or the supporting columns of the engine are utilized for supplying and carrying off the gases and air. For this purpose, the collecting chambers which surround the rings of slot-ports of the working cylinder are connected with hollow chambers in the supporting frame of the columns, or with pipes located in them. In such an arrangement the exhaust and feed pipes of the motor and of the pumps may also be accommodated in the hollow chambers of the supporting frame, "so that gas and air can be fed, delivered, and removed in the shortest way and with the least resistance."

Fig. 1 is a central vertical section through a portion of a vertically arranged double-piston gas-engine with pistons controlling the slot-ports; the ring of exhaust slot-ports being located at the lower part of the working cylinder. The two pistons are shown in their extreme

dead-position, in which the exhaust of the products of combustion takes place through the ring of slot-ports uncovered by the lower piston. Fig. 2 is a similar view showing an engine in which the ring of exhaust slot-ports is arranged in the upper part of the working cylinder. In this figure also the two pistons are shown in their extreme dead-position, in which the entrance of the gas mixture takes place through the lowest ring of slot-ports uncovered by the lower piston.

The cylinder is provided at its lower end with a ring of exhaust slot-ports. It does not rest directly upon the supporting columns of the engine frame, but is carried by a head-piece formed with an annular chamber, and is mounted upon the supporting columns. The lower portion of the cylinder has cast on it three conically turned annular ribs, which bear in a fluid-tight manner against correspondingly bored-out projections or seats on the inner wall of the head-piece, so that the cylinder is mounted in the head-piece like the plug of a plug-tap is mounted in its casing.

Between the inner wall of the head and the outer wall of the lower portion of the cylinder is a hollow space, which serves as a cooling jacket for that part of the cylinder. The hollow outer wall of the head also forms a cooling jacket, which is extended upwardly by a bell-shaped cap fixed on the head, so that the upper portion of the cylinder wall can also be conveniently cooled. The two hollow spaces or jackets communicate with each other at a suitable point (say) by a pipe in the head.

The annular chamber of the head communicates with the exhaust slots, and is otherwise closed, excepting for a crescent-shaped aperture placing the chamber in communication with the hollow main supporting column, or, with a pipe arranged in it, so that exhaust gases from the cylinder pass through the ring of slots into the inconspicuous chamber of the head and thence—freely and unimpeded by the shortest way and with the least possible resistance—into the hollow supporting column or the pipe located in it.

A suitably arranged partition or wall divides a lower portion of the chamber in the head from the main chamber; and this subsidiary chamber is itself divided by a partition or wall into two lower chambers, which respectively communicate with two hollow supporting columns of the engine-frame. In addition to this, a pipe places one such chamber in communication with a lower one of a pair of upper rings of slots; and through another pipe another chamber of the head is placed in communication with the second or higher row of the pair of upper rings of slots. The first-mentioned pipe serves for the conveyance of the scavenging air supplied through one of the hollow supporting columns and corresponding chamber, and the second pipe serves for the conveyance of the gas mixture forced through another of the hollow supporting columns and its corresponding chamber.

In cases where the slot-ports for the exhaust do not lie in the lower part of the working cylinder, but in the upper or central part, a special exhaust pipe may be joined on to the collecting space which surrounds these rings of ports, and be continued downwards outside the supporting frame and through the bed-plate frame by means of a bend. In such cases, the cooling jacket of the bend and of the exhaust pipe can be screwed to the water-jacket of the working cylinder on the one hand, and to the bed-plate frame on the other hand, and thus form a lateral stiffener for the working cylinder.

When the rings of exhaust slot-ports are arranged in the upper portion of the working cylinder (as in fig. 2), the ring of slot-ports for the scavenging air is surrounded by a collecting chamber which communicates directly with a hollow in the frame of the engine. The ring of slot-ports for the mixture of gas and air is surrounded by a collecting chamber which communicates directly with another hollow arranged in the frame of the engine. A portion of the exhaust collecting chamber is divided off from the remainder by a partition; and this part establishes communication between the collecting chamber for air and the corresponding hollow of the frame. Arranged at different heights in the hollows of the frame are projections which serve for the reception of plates, inserted through openings formed above the projections in the frame of the engine and closed by suitable covers. This construction and arrangement provides means whereby the size of the hollow chambers, and the pressures obtaining therein, can be varied so that the engine can be adapted to the working conditions, kinds of gas, &c., employed for the time being.

In the example under notice, the pump for the scavenging air is attached to the pipe junction leading to the collecting air chamber; and the charging pump for the mixture of gas and air is attached to the pipe junction leading to the exhaust collecting chamber.

The products of combustion which emerge from the ring of exhaust slot-ports pass first into the corresponding collecting chamber, from which they are led, through pipes in the lower part of the supporting frame, to a common exhaust culvert. The exhaust pipes and their cooling jackets are screwed to both the outer walls of the collecting spaces and to the lower part of the supporting frame; so that they form a support for the working cylinder, and consequently a portion also of the supporting frame.

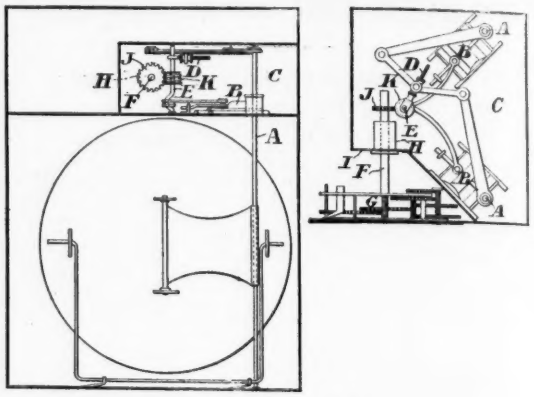
Dry Gas-Meters.

SIMPSON, S., of Exeter.

No. 1282; Jan. 17, 1906.

This invention has for its object to minimize the liability of escape of gas, and also minimize the amount of friction of the mechanism generally and particularly upon the flag wires, "by which a strain is put upon the leather diaphragms which tends to make them porous."

The flag wires A are mounted upon the same sides of the meter as the valves B, and disposed so that they come up into the valve-chamber C immediately behind the valves. A collar (preferably of conical shape) is secured to the flag wire; and on a seating on the bottom of the chamber are mounted levers upon their upper extremities, connecting the outer extremities of the levers with a lever or arm D mounted upon the crank spindle E, which is substantially the same as that usually provided in dry meters.



Simpson's Dry Gas-Meter.

The transmission spindle F, by means of which the movement of the crank spindle E is transmitted to the index mechanism G, is carried within a stuffing-box H mounted on the vertical wall I of the valve-chamber; a worm wheel J on the inwardly projecting extremity of the transmission spindle engaging with a worm K upon the crank spindle E, by which the movement of the latter is communicated to the index mechanism.

The shape of the transverse vertical wall I of the valve-chamber is modified to accommodate the whole of the valve mechanism within the chamber. The wall is provided in a position transverse to the axis of the transmission spindle for convenience in mounting the stuffing box or bearing H for the transmission spindle upon the wall. The relative position of the valves B, crank spindle E, and index mechanism G, is thus not modified from that usual in dry meters of ordinary construction.

APPLICATIONS FOR LETTERS PATENT.

26,116.—SUTTON, C. J., and RUDD, J., "Atmospheric burner independent of air supply from the room in which it is used." Nov. 19.
26,183.—DEFAYS, V., "Gas-valves." Nov. 19.
26,223.—GROSSMANN, J., "Treatment of ammonia liquors." Nov. 20.
26,268.—SPENCER, J. W., and NICHOLSON, H., "Valves for gas regenerative furnaces." Nov. 20.
26,314.—SMITH, H. E., "Carburetting air." Nov. 20.
26,319.—TULLY, T. D., "Manufacture of sulphate of ammonia." Nov. 21.
26,360.—BELTON, J. C., "Hot-coke barrows." Nov. 21.
26,504.—CAVE-BROWNE-CAVE, C. B., "Generating acetylene." Nov. 22.
26,542.—BARLEN, R., "Vertical coke-oven." Nov. 22.
26,570.—THORP, T., "Fluid meters." Nov. 23.
26,696.—THORP, T., "Reciprocating fluid meters." Nov. 24.
26,698.—KURZER, L., "Carburetting air." Nov. 24.
26,725.—WEDEKIND, C., "Gaseous fluid turbine." Nov. 24.
26,747.—TWEEDIE, R. O., "Inverted bunsen burner." Nov. 24.
26,765-6-7.—DEUTSCHE-GASGLÜHLICHT AKT-GES. (AUERGES.), "Inverted incandescent gas-lamps." Nov. 24.
26,768.—EADY, L. H., & E. W. H., "Mantles and burners." Nov. 24.

Striking Policy of Retrenchment at Halifax.

Under this heading, the "Halifax Courier" publishes the following paragraph: "Whatever is done in other departments of the Halifax Corporation in the way of keeping the capital expenditure within reasonable bounds (and it is evident, with the upward tendency in rating, that this is an important detail in local administration), it is clear that there is the exercise of firmness under this head at the gas-works of the Halifax Corporation. That Mr. Collinson, the Chairman of the Gas Committee, has around him colleagues who support him in this policy, may also be taken for granted. The facts are patent from the return of the financial position of the gas-works at the end of September, compared with its indication at the end of last March. The figures show that during the six months covered, so far as the inside of the works are concerned, the capital expenditure has not been added to. Instead, there has been a credit of £150; being the first instalment of £3000 arising from the sale of the tar-works to Mr. Ellison. Coming to the outside of the works, the capital expenditure has been increased to the extent of £851; but it has to be remembered that much of this expenditure has been unavoidable. Meters and mains to new property are a necessity. Credits represent £360; and consequently this addition is brought down to below £500. In a sentence, the capital expenditure at the end of September was £660,287, compared with £659,797 at the end of March. These figures are remarkable when taken in conjunction with the pronounced upward tendency of capital expenditure not many years ago. The result attained is all the more creditable because of the fact that the Committee are responsible for 195 miles of mains. Allowing for £142,695 which had been paid through the medium of sinking fund, the debt on the works is about £500,000, and the Committee have borrowing powers not utilized to the extent of £25,124.

Acting under the powers of the Glamorgan and South Wales Water Act passed in the last session of Parliament, the Water Committee of the Glamorgan County Council have appointed Mr. R. E. Middleton to make a survey of available watersheds.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by Correspondents.*]

The Kent County Gas Company's Case.

SIR,—With reference to the results of our proceedings in connection with this Company, we take the opportunity of thanking you, on behalf of our clients, for the assistance which you have given us, which assistance has led to so successful an exposure of the Company and its officials and promoters.

14, *Clements Lane, E.C.*, *Nov.* 28, 1906. CORBOULD-ELLIS AND MITCHELL, Solicitors.

The Disposal of Ammoniacal Liquor in Small Works.

SIR,—On first reading "Gas Manager's" letter in your issue of this week, I had a smile to think that a works making 8½ millions should, in the form of ammoniacal liquor, put a considerable sum of money into the town sewer. But, on further consideration, I recognized its serious side, and decided to accept "Gas Manager's" invitation to receive suggestions on the subject, which I trust will be of some help to him.

I would certainly say, "Give up putting the liquor into the sewer altogether." "Gas Manager" does not indicate whether or not he has difficul y in disposing of his tar; but I take it that he has no dealings with chemical manufacturers, and that he has a ready local market for his tar.

If "Gas Manager" has failed in getting chemical manufacturers to buy his ammoniacal liquor, I would suggest that he take up with his nearest brother manager whom he knows has a sulphate plant, and make the best bargain he can with him. The liquor could be filled into barrels and transferred by rail.

I would not recommend the introduction of a sulphate plant into a works of under 10 millions make; but if "Gas Manager" is beaten in the course I suggest, I would certainly advise him to seriously consider the cost between a sulphate plant and that of laying a separate sewer. With the former, a return would be given for the capital expended; while the latter case would be all outlay and no return.

"Gas Manager" also states that a large sum of money has recently been spent in extending the works. From this, I take it that his make of gas is increasing, which in itself might warrant his considering the erection of a sulphate plant.

In connection with the disposal of residuals generally, it is to be hoped that the recommendation put before the North British Association of Gas Managers, at their meeting in July of this year, by Mr. Lawrence Hislop, of Uddingston—to form a Commercial Section to protect our interests specially in this direction—may be taken up in a whole-hearted fashion by the Committee then appointed; for I thoroughly believe that until gas corporations and companies take this combined action, we will not get the return from our bye-products we should get.

Nov. 30, 1906. A. M.

PARLIAMENTARY INTELLIGENCE.

NOTICES GIVEN FOR BILLS (SESSION 1907) RELATING TO GAS AND WATER SUPPLY.

The following notices for Bills have been given, in addition to those published in the "JOURNAL" last week (p. 621).

Birkenhead Water.—The Birkenhead Corporation will apply for power to construct an extensive series of new works, consisting of several impounding and other reservoirs, aqueducts, and road diversions in the counties of Denbigh, Merioneth, Flint, and Cheshire; collect and impound the waters of the Rivers Alwen and Brenig; acquire lands, and the mines or minerals thereunder; and take measures for the protection from pollution of the water and the works supplying it. Provision will be made for the sale of water in bulk or otherwise to urban, rural, or sanitary authorities. It is proposed to ask for the repeal of certain sections of the Corporation's Act of 1881, and for permission to alter the existing rates and charges. Enlarged borrowing powers will be required.

Boston Spa Gas.—Application will be made by the Boston Spa Gas Company, Limited, to be dissolved and re-incorporated, with power to maintain the existing works, extend and improve them, and supply gas within the parishes of Boston Spa, Bramham-with-Oglethorpe, Clifford, Collingham, Thorpe Arch, and Walton, in the rural district of Wetherby, in the West Riding of York. The usual powers granted to gas companies will be asked for, including authority to apply for a Provisional Order for the supply of electricity within the defined district. It is intended to ask for the amendment of the Tadcaster and Wetherby Gas Order of 1883, and the repeal of any powers the Tadcaster and Wetherby Gas Company, Limited, may have for supplying gas within the parishes of Thorpe Arch and Walton. The present capital is to be defined and regulated, and more will be applied for.

Broadstairs and St. Peters Water.—Power will be sought by the Broadstairs and St. Peters Urban District Council to improve their existing water-works, and construct others, consisting of a well and pumping-station and an underground heading in the parish of Eastry, and a line of pipes therefrom to a tower and tank to be erected in the parish of St. Peters Extra. The Bill to be promoted will contain a number of provisions for preventing the waste and contamination of the water, the supply of meters and fittings, the levying of rents, rates, and charges, and the borrowing of money.

Bude Gas.—Powers of incorporation will be sought for a company to construct works and manufacture and supply gas in the urban district of Stratton and Bude, and the parishes of Stratton, Poughill, Poundstock, and Marhamchurch, in the county of Cornwall. The usual authority will be required for purchasing lands, opening streets, levying rates and charges, supplying gas in bulk, &c.

Colne Valley Water.—The Colne Valley Water Company intend to apply for authority to raise additional capital by auction or tender, and to issue to the present proprietors, to the consumers, or to the employees any not so disposed of. Authority will be sought to grant pensions and retiring or superannuation allowances to the officers and servants, to make provision in regard to the moneys or funds out of which they are paid, and to erect, fit up, maintain, or let houses, cottages, and buildings for their servants.

Devonport Corporation.—Application will be made by the Devonport Corporation for authority to construct additional works, consisting of a reservoir and a filter-bed in the parish of Tamerton Foliott, a service-tank in the parish of Walkhampton, and two pipe-lines in connection therewith. Provisions in regard to the supply and the purity of the water, as well as to its sale in bulk, will be included in the Bill, which will contain clauses conferring further borrowing powers upon the Corporation.

Newquay and District Water.—Authority will be sought by the Newquay and District Water Company to extend their limits of supply so as to comprise the urban district of Newquay and the parishes of St. Columb Major, Colan, and St. Columb Minor, all in the county of Cornwall; and also to construct additional works, consisting of a covered reservoir, two pumping-stations (with the necessary underground headings), and eight pipe-lines. The Bill will contain provisions in regard to pressure, the supply of fittings, &c., as well as for empowering the councils of districts wholly or partly within the Company's limits to guarantee, with the consent of the Local Government Board, the expense incurred by the Company in affording a supply of water to any houses in the district of such council. Further capital and borrowing powers will be applied for.

Penrith Urban District Council.—The Urban District Council of Penrith will apply for authority to extend their limits of gas supply so as to include several parishes in the rural districts of Penrith and West Ward, in Westmorland, and also for further powers in regard to the sale of gas, its quality, and the supply of meters, fittings, &c. They will also seek authority to construct additional water-works, consisting of a dam or embankment for raising the level of Hayes Water, two tanks, and four aqueducts or pipe-lines, all in the counties of Westmorland and Cumberland, and to acquire certain reservoirs which are now held by them under lease. The Bill to be promoted is a general one; and it will contain the usual provisions in regard to the supply of water, such as its sale in bulk, prevention of waste, &c. Additional borrowing powers will be sought.

Pontypridd Urban District Council.—Power will be sought by the Pontypridd Urban District Council to amend the provisions of their existing enactments in regard to the quality and testing of gas, to make provision with respect to the size and material of the pipes and fittings to be laid by the consumer, the exemption of the Council from penalties in certain cases, and from liability to supply with gas any person in debt to them, the period for which allowances or surcharges are to be made in the event of meters being found to be defective, and the exemption of the Council's meters, engines, stoves, &c., from liability to distress or to be taken in execution or in proceedings in bankruptcy, and to provide that they shall remain the property of the Council though fixed to the consumers' premises. Application will be made to increase the gas reserve fund; and the Bill will contain provisions as to the borrowing of money and other financial matters.

Selsey Water and Gas.—Application will be made for the incorporation of a Company to supply gas and water in certain parishes in the county of Sussex. It is proposed to purchase the gas-works of the Petersfield and Selsey Gas Company, and to enable this Company to accept payment in shares or debentures of the new one. Power will be sought for the construction of water-works, comprising a well and pumping-station in the parish of North Mundham, and a conduit or pipe-line in connection with it. The capital of the Company will be defined in the Bill to be promoted, which will contain clauses for the repeal of certain provisions of the Petersfield and Selsey Gas Act, 1901, and also of the Chichester Corporation Water Act, 1897, so as to exclude from the water limits defined in the latter Act any parishes proposed to be included within the area of supply of the new Company. The name of the Petersfield Company is to be altered, and the capital powers are to be defined.

PROVISIONAL ORDER APPLICATIONS (SESSION 1907).

Board of Trade, under Gas and Water Works Facilities Act, 1870.

Dorking Water.—Power will be sought by the Dorking Water Company to raise additional capital.

Fermoy Gas.—The Fermoy Gas Company will apply for power to maintain, continue, and enlarge their gas-works, and supply gas within certain townlands, including the urban district of Fermoy, in the county of Cork. The present capital is to be defined, and authority will be sought to increase it.

Freshwater Gas.—Application will be made by the Freshwater Gas Company, Limited, for power to raise additional capital, and to amend, so far as may be necessary for the purpose, the Order obtained by the Company in 1899, and any Act or Order relating to them.

Herts and Essex Water.—The Herts and Essex Water-Works Company, Limited, will apply for authority to extend their limits of supply so as to include a number of parishes in the counties of Herts and Essex, and exercise all their powers therein. It is proposed to acquire by agreement the water-works belonging to the Rural District Council of Hadham which are situated within the proposed extended limits, and used for the supply of water within the parishes of Much and Little Hadham, or any other part of the rural district. Additional capital will be required.

Mid-Kent Water.—Authority will be sought by the Mid-Kent Water Company to extend their limits of supply so as to include a number of parishes and places in Kent, and to alter those of the Cranbrook District Water Company by excluding therefrom the parish of Woodchurch, and relieving the Company from all liability in respect of it. Additional capital will be required.

New Tredegar Gas and Water.—The New Tredegar Gas and Water Company, Limited, will apply for power to raise additional capital. It is proposed to alter and amend the New Tredegar Gas and Water Order, 1878, and to incorporate with it all or some of the provisions of the Companies Clauses Acts of 1845, 1863, and 1869.

Seaford Gas.—Application will be made by the Seaford Gas Company, Limited, for power to maintain, continue, extend, and construct gas-works, and manufacture and supply gas in the urban district of Seaford, in Sussex. The existing capital is to be regulated and defined, provision will be made with regard to the borrowing powers, and a sliding-scale of price and dividend is to be adopted. Authority will be sought to form reserve, insurance, and renewal funds.

Skegness Gas.—Application will be made by the Skegness Gas Company, Limited, for power to raise additional capital, and to incorporate with the Order applied for some of the provisions of the Skegness Gas Order, 1902.

Twyford Gas.—The Twyford Consumers' Gas Company, Limited, will apply for authority to maintain and continue their existing works, make alterations and additions to them, and supply gas within the parishes of Sonning, St. Nicholas Hurst, Ruscomb, and part of the parish or liberty of Sandford and Woodley, in the county of Berks. An increase of capital will be required.

Woking District Gas.—The Woking District Gas Company, Limited, intend to apply for power to further increase their capital by the creation of 6000 shares of £5 each, and by borrowing on mortgage, debenture stock, bonds, or otherwise.

Secretary for Scotland, under the Private Legislation Procedure (Scotland) Act, 1899.

Aberdeen Corporation.—The Corporation of Aberdeen will apply for authority to appropriate certain lands for the manufacture and storage of gas and residual products, to supply gas for lighting, heating, and other purposes on such terms as may be prescribed in the Order, and to make such differential charges as they may think fit. They also wish to be empowered to allow discounts or rebates to consumers in consideration of prompt payment or large consumption, and to be relieved from liability to penalties in cases of failure, arising from avoidable cause, in connection with the supply of gas. It is proposed to ask for the repeal of the Corporation Acts of 1871 and 1881 with respect to the quality, illuminating power, pressure, and testing of gas, and for permission to reduce the illuminating power, alter the method of testing, and make other provisions in these respects. Authority for raising more money will be sought.

Dundee Corporation.—The Corporation of Dundee intend to apply for an extension of the municipal boundaries so as to include the whole parish of Dundee and the united parishes of Mains and Strathmarline, or one of them, in the county of Forfar; and it is proposed that the price of gas within the added district shall be at least 1s. per 1000 cubic feet more than that charged in the existing burgh. Authority will be sought to enable the Corporation to provide the plant to light private streets, courts, or common stairs, in default of the owners doing so, and also to furnish the illuminant. They will likewise ask for power to inspect gas-fittings put into new houses.

Edinburgh Corporation.—Application will be made by the Edinburgh Corporation for authority to construct works for the abstraction of water from Lochend Loch for condensing purposes, and to alter the water level of the loch. Necessary money powers will be sought.

Glasgow Corporation.—Authority will be sought by the Glasgow Corporation to amend the Glasgow Police Act, 1866, relating to the lighting of streets, courts, and common stairs, so as to place upon owners the duty of providing the lamps, posts, fittings, &c., required for the purpose, or defraying the cost should these appliances be furnished by the Corporation. It is proposed that the Corporation shall have power to levy an assessment in respect of the public lighting—one half on the owners and the other on the tenants or occupiers. The Corporation will ask for the amendment of their Acts of 1869 and 1882 in regard to the illuminating power and testing of the gas, as well as for permission to make other provisions with reference thereto. They will also seek authority to acquire the undertaking of the Busby Water Company, situated within the counties of Lanark and Renfrew, together with all the rights and privileges appertaining to it. The Order will confirm any agreements entered into between the Corporation and the Company in regard to the transfer. Additional borrowing powers will be applied for.

Kilmarnock Corporation Water.—The Kilmarnock Corporation intend to apply for authority to construct additional water-works, consisting of a reservoir on Loch Burn, a conduit or pipe-line from it to the parish of Fenwick, in Ayrshire, and an access road to the reservoir. The Order to be applied for will contain provisions in regard to the prevention of pollution of the water, the pressure at which it is to be supplied, and other matters. More money will be required.

Paisley Corporation.—Power will be sought by the Paisley Corporation to construct additional water-works, consisting of two reservoirs, a similar number of aqueducts or pipe-lines, and a road diversion. It is proposed to alter or repeal some of the provisions of the Paisley Water-Works Act, 1881, relating to the construction of works, the supply of compensation water, and other matters. Authority will be required to borrow further money, and to impose additional rates and charges in respect of the water-works and improvements contemplated.

Renfrewshire Upper District Water.—Authority will be sought by the County Council of Renfrew to acquire the undertaking of the Busby Water Company, construct additional works, consisting of two reservoirs, a filter and clear-water tank, three embankments, four conduits or pipe-lines, and an access road. The limits of supply are indicated in the notice, and will be fully defined in the Order; but power will be sought to go beyond them. The Glasgow Corporation are to be excluded from supplying water within the proposed area; and provision will be made for the transfer of portions of it to the County Council of Lanark. The Malletsheugh special water supply district is to be abolished. Some additional borrowing powers will be required.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—REFEREES COURT.

(*Before Mr.* VEREY.)

Benning and Others v. Ilford Gas Company.

Last Wednesday morning, after a hearing extending over several days, judgment was delivered by the Official Referee in this case, as well as in that mentioned below. Both these actions are very similar to many others which have previously been reported in our columns;* and as also the evidence and witnesses were much the same as before, a detailed report of the proceedings need not be given. The action arises out of damage done to certain property by floods which occurred in the valley of the River Roding in June, 1903; and the defendants having admitted liability, the matter came before the Official Referee to assess the actual damage (if any) due to the defendants' negligence. There were several plaintiffs in the action, having varying interests in the flooded houses in Landseer and Gainsborough Avenues, Ilford; 29 houses being the subject-matter of this inquiry. The original claim was for £1115 15s.—afterwards amended to £892 0s. 5d.

Mr. D. C. LECK and Mr. A. LINCOLN REED appeared for the plaintiffs; and Mr. SYLVAIN MAYER (with whom was Mr. R. STOREY DEANS) for the defendants.

The OFFICIAL REFEREE, in delivering judgment, said that, under the order of reference, the defendants were liable to the plaintiffs for damage to the property directly caused by the flood. The facts were that water from the River Roding got into the houses; that previously there had been 72 hours' rain; and that the land was saturated. Except for defendants' negligence, the water would not have risen to the height of 2 ft. 6 in. above the floors. The plaintiffs' 29 houses were of a poor, speculative class, built on unsuitable soil. The level of the ground was below high-water mark; and undoubtedly water stood in the soil in rainy weather. As to the claim for repairing damage to the houses, in law the plaintiffs were only entitled to recover the amount necessary to put the houses into the state that they were in before the flood. It was clear that the claim put forward by the plaintiffs was much exaggerated, and could not be supported. Very little satisfactory evidence had been produced as to the state of the houses before the flood; and very little damage could be attributed to it. An allowance of £1 per house would be sufficient under this head. The claim of 9s. per house for clearing up would be wholly disallowed. As to the loss of rent, the evidence was very unsatisfactory. There were no rent-books, and no records kept of the tenants' leaving. The claim had been made without sufficient care. Other causes, besides the flood, operated against the houses; and there was a prejudice against the site. An allowance of £2 12s. 6d. per house would be fair. The claim for doing repairs not ascertainable at the time of the flood could not be supported. As to the alleged presence of sewage, he found that there was none. The earth below the floors had not been contaminated by the flood. There had not been any permanent structural damage caused by the flood; and the buckling of the floors was due to bad laying, to want of concrete, and to the soil. The total award amounted to £83 15s.; but as the defendants had paid more than this into Court—namely, £100—they were entitled to judgment with costs from and after the date of payment into Court. As to the costs, the plaintiffs urged that the lump sum paid into Court was invalid, as it ought to have been allocated among the different plaintiffs. But the plaintiffs were not embarrassed by it; and they had put in no plea.

Mr. LECK asked leave to appeal on the question of costs, and as to the payment into Court.

The OFFICIAL REFEREE said that the plaintiffs had failed on very substantial issues, and on the large issue of permanent damage. Leave to appeal was given if necessary.

Roberts and Others v. Ilford Gas Company.

This was an action similar to the foregoing, and arising out of the same circumstances. It related to nine houses in Gainsborough and Landseer Avenues, Ilford. The plaintiffs claimed £531 2s. 9d. They were awarded £30, which was the amount defendants paid into Court.

The OFFICIAL REFEREE delivered judgment on the 28th ult. He found in this case also that £1 per house was sufficient to meet the repairs. There was a claim for £78 2s. for the alleged rebuilding of a flank wall, and about which there was considerable conflict of evidence as to whether it had or had not been rebuilt. If rebuilt, he said, was it the direct result of the flood-water? There was no evidence as to the condition of the wall before the flood; and he was clearly of opinion that the nature of the soil and the foundations were alone sufficient to cause the rebuilding. The plaintiffs could not recover. It would be fair to allow something for loss of rent for certain houses; and a total of £30 would be a sufficient award to the plaintiffs for all claims. This amount having been paid into Court, the defendants were entitled to judgment, with costs.

* See reports of *Benning v. Ilford Gas Company*, "JOURNAL," Vol. LXXXVI., p. 247; Vol. LXXXVII, p. 401. *East Ham Corporation v. Ilford Gas Company*, Vol. XCI., pp. 127, 256; Vol. XCII., pp. 692, 763; Vol. XCIII., p. 300. *Ocean Accident and Guarantee Corporation, Limited, and Others v. Ilford Gas Company*, Vol. LXXXIX., pp. 366, 585; Vol. XCI., p. 324; Vol. XCII., p. 839; Vol. XCIII., p. 299. *Bethell v. Ilford Gas Company*, Vol. XCV., p. 390.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Tuesday, Nov. 27.

(*Before Mr. Justice* JOYCE.)

In re Kent County Gaslight and Coke Company. Limited—Ex parte Brown and Others.

To-day his Lordship had before him a number of applications by parties to have their names taken off the register of the Company.

Mr. HUGHES, K.C., and Mr. MARTELLI (instructed by Messrs. Corbould-Ellis and Mitchell) appeared for the applicants, except one who was represented by Mr. PITMAN; Mr. GORE-BROWNE, K.C., and Mr. KIRBY (instructed by Messrs. Barnes and Bernard) appeared for the Company.

Mr. HUGHES said this was a combination of many different cases, being applications under section 35 of the Companies Act by about 23 people to have their names taken off the register of the Company, and the money paid by them refunded, on the ground that the prospectus, on the faith of which they applied for shares, did not represent the facts. This was stating the case very moderately; for no doubt one might put it much more strongly without exaggeration. The prospectus was issued about the 14th of May; and the chief point was that a gentleman who was intended to be the Chairman, and who was put forward as a man of large experience in connection with gas-works, had resigned before the date of the allotment, and that this fact ought to have been made known to the applicants. It was disputed whether he had effectively resigned. In his (Counsel's) view this did not matter, because at any rate the other Directors knew perfectly well either that he had resigned or was about to do so, and that he was the only Director who had any experience in connection with gas-works, and his experience was put forward as an inducement to applicants. The other point was that in truth the whole prospectus was extremely misleading, apart from many specific statements in it being untrue. The Company was called the Kent County Gaslight and Coke Company; but, in point of fact, it was formed to take over very small gas-works at Goudhurst, a village near Tunbridge Wells, doing a very small business indeed, and having no possibility of doing a large one. It carried on business for many years, and seemed to have been making a little profit at times, and at others a small loss—the average profit being about £5 a year.

Justice JOYCE said he noticed the prospectus stated that "it was the largest parish in England."

Mr. HUGHES believed that was true; but its population was very small, though its area was very large, which was, of course, a considerable disadvantage to any gas company. He understood that in 1891 the population was 2734; and in 1901 it was reduced to 2725. The consumption of gas had been something like 3 million cubic feet per annum; and, according to the evidence, it could not possibly pay to lay mains to the outlying districts. The learned Counsel then read and commented upon the prospectus, in which attention was first drawn to a number of gas companies paying good dividends, which, as he pointed out, were in totally different circumstances; and it then went on to say that the vendors were so confident with regard to the prospects of the Company, after the developments which were to take place, that they had guaranteed a dividend of 6 per cent. on the preference shares for the first year, and further undertook that the dividend on the ordinary shares should not be less than 8 per cent. for the same period, and that they would lodge with the Company a sufficient sum in cash for the due payment thereof. Then the prospectus described the works, which were located at Goudhurst, and stated that it was proposed to extend the gas-mains to 14 places named, which, it was said, afforded very considerable scope for the Company's developments. Reference was also made to requisitions agreeing to use gas having been signed by a large number of the inhabitants of these districts. As a matter of fact, many of the places were not districts at all. Some were merely small villages, with a few labourers' cottages; and in other places there was merely a single farm-house. Then the prospectus referred to the profitable nature of gas companies as an investment—which was illustrated by the cases of the Tunbridge Wells, Sevenoaks, Tonbridge, and Canterbury Companies. Of course, these illustrations were totally fallacious; Tunbridge Wells having a gas consumption of about 275 million cubic feet per annum, and Canterbury 170 millions. Then it went on to quote a number of other gas companies paying good dividends, and stated that an important feature of the Company's business would be the supplying and fixing of penny-in-the-slot meters and gas-cookers to small consumers, which would prove a considerable source of revenue. In corroboration of this, the prospectus referred to the case of the South Metropolitan Gas Company, who had 182,000 of these meters; and pointed out that the "JOURNAL OF GAS LIGHTING" stated that it was quite a usual thing for inspectors and collectors to take out 2,500,000 pennies in a few days. Then it said that the Company would have the advantage of the services, as Chairman, of Mr. S. B. Darwin, who had been connected with the Portsea Island Gaslight Company for over twenty years, and that the dividends paid by that Company for the past sixteen years had been 13 per cent. per annum. As he had already said, before the allotment of shares was actually made it was known that Mr. Darwin was not going to be either the Chairman or a Director of the Company. Then the prospectus set out a report upon the property, by Mr. G. T. Harrap, Assoc.M Inst.C.E., M.Inst.M.E., the concluding paragraph of which was: "The extent of the area to be covered in these districts should, in my opinion, at a modest computation, result in a sale of over 50 million cubic feet of gas per annum; and this should be a constantly increasing quantity in accordance with the progress and development of the further districts." Then it was stated that the price of gas was 5s. per 1000 cubic feet; and, taking the consumption at only 50 million cubic feet per annum, the future income would be over £15,000, which, after allowing for expenses, would permit of the payment of 6 per cent. on the preference shares and 14 per cent. on the ordinary shares—still leaving a surplus available for further dividends, &c., of upwards of £2000. This was embodied in a certificate by Mr. Parker, Chartered Accountant. A plan enclosed with the prospectus showed the surrounding districts to which it was proposed to extend the mains. It was headed "Plan of Mains," though, according to the statement in the prospectus, it should have been "Plan of Proposed Mains." There was nothing to indicate what actual mains there were. Probably they were roads shown on the plan.

Justice JOYCE said he thought they could not lay mains along any public road without statutory authority.

Mr. HUGHES thought not, except by consent. He believed they had no statutory power.

Mr. GORE-BROWNE did not suggest that they had statutory power; but they had got along the roads somehow.

Justice JOYCE said he was not sure that a road authority could consent, or that their consent would be of any value.

Mr. HUGHES then continued to read from the prospectus, and said it set out that an agreement had been entered into, dated April 17, 1906, between F. C. Lawson and Co., of Cranbrook, Gas-Works Proprietors, and Charles Archer, of Kingston-on-Thames (as Trustee for the Company), whereby the gas-works, including the goodwill, freehold land, plant, machinery, stores, mains, services, and all rights and contracts, &c., were sold for the sum £21,800, to be paid 20 per cent. in cash and the balance in either cash or shares by an allotment of fully-paid up preference or ordinary shares. It would appear that only in October, 1905, the whole property was bought for £2350—the conveyance or assignment not, in fact, having been completed until March, 1906. He submitted that the whole of the prospectus, apart from specific misstatements, was misleading. The consumption at present was only about 3 million cubic feet; and the results while the former Company were actually carrying on business were: In 1897, there was a profit of £37 12s. 6d.; in 1898, a loss of £13 17s. 3d.; in 1899, a profit of £32 10s. 3½d.; in 1900, a loss of £36 12s. 1½d.; and in 1901, a profit of £3 6s. 6d. This, he believed, was an average profit of only £5 15s. per annum. In 1902, the works were leased by the existing Company to a Mr. Hyde, at a rent of £40 a year, with an option of purchasing at £1150. Mr. Hyde carried the concern on till his death in 1904; and it was said (they only had his word for it) that when his Executor was seeking to sell it in 1904, the profit was £366. The evidence would show that the outside consumption to be expected in the district was 10 million cubic feet per annum, from which there could not be anything like enough income to pay dividends on this large capital. The public had subscribed about £29,000 for shares; and the vendors managed to get the whole of their purchase-money (£21,800) in cash. The amount of money actually received up to date was £24,030 odd; so that there was a very small sum left for the extraordinary development of the works proposed. It would also appear by the evidence that, in order to supply the quantity of gas mentioned, it would be necessary to spend from £3000 to £4000 on the works; while all the Company could possibly have in cash was some £700. Mr. Darwin's connection with the Company arose in this way: He answered an advertisement for "a gentleman to join the Board of a good gas company; preference given to someone with good business experience." He thought this would be an opportunity of supplying himself with both work and some little remuneration; and he got into communication with the promoters. Ultimately, he agreed to join the two other gentlemen named in the prospectus as Directors—namely, Charles Archer, of Kingston-on-Thames, Merchant, and J. Ll. Burgess, Bourne End, Bucks, Contractor. On May 3, the three Directors attended a meeting, apparently to approve the prospectus. According to Mr. Darwin's evidence, he only approved it subject to his seeing the gas-works and the district before the prospectus was issued.

Mr. GORE-BROWNE: There is a resolution in his own handwriting that the prospectus should be issued on May 14.

Mr. HUGHES said his view was that Mr. Darwin made it a condition precedent that the Directors should view the place before issuing the prospectus. However, the prospectus went out; and on May 19 a meeting was called for the purpose of making the allotment. On that day, Mr. Darwin went to the office of the Company and saw, he believed, the promoters and the other two Directors; and he told them it was not right that the prospectus should have been issued before they had seen the place; that he had not been properly treated; and that he should not continue to have anything to do with the Company. On the same day, as soon as he reached home, he wrote to several newspapers stating that he had resigned his position as Chairman, as he had not had sufficient information afforded him, and therefore was not competent to judge of the chances of a successful issue, and could not, therefore, conscientiously remain a member of the Board. There was some conflict in the evidence as to what exactly happened; but Mr. Darwin's view was that he definitely and irrevocably told the other persons present that he would not act as a Director. He did not know that it was disputed; but at any rate it was suggested that there was no formal or effective resignation. But whether this was so or not, he submitted that the threat to resign was a material fact which should have been communicated to the applicants. Mr. Darwin was the only gentleman on the Board with experience of gas-works management; and his name was, of course, put forward with a view to induce applications. The promoters certainly were in a great hurry to allot, because the prospectus stated that the list would close on or before May 21, and yet two days before this date they proceeded to allot, though the whole issue had not then been nearly subscribed. The applicants had all made affidavits, which naturally bore a considerable resemblance to one another.

Mr. GORE-BROWNE: They are all identical.

Mr. HUGHES said there could not be much variation. They all said that they relied, in the first place, on Mr. Darwin's name; secondly, on the statements as to the nature and number of the districts, and so on; and, thirdly, on the fact that the agreement of Oct. 5 for the sale of the property for £2350 was not disclosed.

Justice JOYCE asked what was the state of the law with regard to material facts being disclosed. What effect the statement that Mr. Darwin had resigned for certain reasons would have had, he could not say.

Mr. HUGHES could not help thinking that if the applicants had, before the allotment, seen his letter, they would have withdrawn their applications. There were two cases to which he might refer: *Traill v. Baring* (4 De Gex, Jones, and Smith) and, *In re the Petroleum Company*

(23 Ch. Div.). In the latter case, the fact relied upon was the resignation of a director not being communicated. Having read passages from the judgments in the two cases cited, Counsel said that notice had been given to cross-examine all these applicants on their affidavits; and they were present for this purpose. He would read one affidavit as a specimen—that of Major Porter, who applied on the 16th of May for 50 preference shares. He stated that he did so on the faith of the prospectus, in which he particularly noticed the statement with regard to Mr. Darwin being the Chairman of the Company, and that he attached great importance to having so experienced a man at the head of affairs.

Justice JOYCE suggested that it could hardly be disputed that these applicants applied for shares on the faith of the prospectus; but, supposing they did not rely particularly on the statement about the Chairman, still if the Chairman resigned on the ground suggested before allotment, were they not entitled to be told that?

Mr. HUGHES: Certainly.

Justice JOYCE did not think it mattered whether or not they noticed the statement. If they were suing for damages, they must prove that which would support an action of deceit; but it was impossible for the Company to argue, with any effect, that the chairmanship being held by Mr. Darwin was not a material fact, because they had insisted on it in the prospectus. If Mr. Darwin resigned before the allotment, he thought they were bound to publish this fact. In his view, this was not only the law, but common honesty.

Mr. GORE-BROWNE said he had no doubt that all these applicants would say that if they had been told of Mr. Darwin's resignation they would have withdrawn their applications; and therefore he did not think it was right to waste time by cross-examining any of them as to whether or not they considered this statement essential, or whether they would have done so had they known the fact.

Mr. HUGHES then proceeded to read the other affidavits. The first was that of Mr. Darwin, who swore that he had resigned on the 19th of May, before any allotment took place. The next affidavit was by Mr. Robert Bruce Anderson, who said that on the 7th of June he visited Goudhurst with the view of verifying the statements in the prospectus; that he considered them grossly exaggerated and misleading; that the village of Goudhurst was three-quarters of a mile from the railway station; that there were 17 possible customers on the road between the station and the village; that the station was lighted by oil; that in the village there were 170 small houses, including 50 shops; that the gas-works were half-a-mile off; that on the road between the village and the works there were another 20 small houses; that the works were small, with one gasholder capable of containing 5000 cubic feet of gas; that all the places named in the prospectus were only scattered villages, consisting mostly of labourers' cottages; that there was one house occupied by a retired Lord Justice, who was a large consumer of gas; that many of the places consisted chiefly and simply of a farm; that there were no signs of new buildings, except in two places; but that there were two or three churches and schools. Assuming mains were laid to these places, the possible consumption of gas could not in any event exceed 10 million cubic feet per annum. In 1905, the actual consumption was 3 million cubic feet by 90 customers. He estimated the cost of the present works at less than £2000; and their selling value was certainly not more than £1000. To supply 50 million cubic feet of gas per annum would require new works costing about £40,000. The next affidavit was by Mr. Charles Hunt. He said the production of gas at Goudhurst in 1905 was 3½ million cubic feet; and that for the supply of this quantity new works, including mains, services, and everything, should not exceed from £3000 to £4000. The price of £21,800 was altogether extravagant, being at the rate of £6228 per million cubic feet. The average cost of a similar undertaking would be about £495 per million. He understood that in the various districts mentioned there were about 340 houses and two or three churches and schools; a large proportion of the inhabitants being labourers living in cottages. It was never found that more than two-thirds, or three-fourths at the outside, of the occupiers of a place became gas consumers; and this was a very scattered district, in which it would never pay to lay gas-mains—in fact, it might be described, if not as a stagnant, as a standstill district. He regarded Mr. Parker's estimate of profit as too sanguine. Then Mr. Arthur Joseph Ellis made an affidavit; and he proved that the gas-works were leased to Mr. Hyde in 1882 for five years, at £40 a year. The Gas Company was a small one, with a paid-up capital of £1585; and there were hardly any profits. Some of the districts named in the prospectus were in parishes adjoining, and, so far as Hawkhurst was concerned, were already supplied.

Mr. GORE-BROWNE then read the affidavits on the other side. He took first that of Mr. Archer, one of the original Directors, who said that Mr. Darwin had attended meetings held on the 23rd and 30th of April and the 3rd of May, and apparently took great interest in all the Company's affairs—in many instances writing the resolutions and minutes himself. The resolution passed on the 3rd of May—viz., "That the prospectus, having been read, be approved, signed, and ordered to be filed with the Registrar of Joint-Stock Companies, and issued to the public on the 14th of May—was written by Mr. Darwin in the *agenda* book. At that meeting he also signed the prospectus. Mr. Darwin did not attend the meeting on the 19th of May; and he (Mr. Archer) was extremely surprised to learn of his letter to the papers stating that he had resigned the chairmanship, while he had not even intimated, either verbally or in writing, his intention to retire, nor did he sign any such letter until the 15th of June. Attached to this affidavit were several letters that passed between Mr. Darwin and the Secretary of the Company, which were read; and the affidavit concluded by stating that the paragraph in Mr. Darwin's affidavit in which he said that he had resigned on the 19th of May was absolutely untrue. Next came a joint affidavit by Mr. Archer and Mr. Burgess, which was similar in effect to the previous one, and reiterated the statement that at no meeting of the Company did Mr. Darwin state his intention to resign. Then came an affidavit by Mr. Harrap, the Engineer to the Company, who said that he had had 35 years' experience in engineering, and that he had read copies of the affidavits of Mr. Anderson and Mr. Hunt. He had inspected the gas-works, &c., and the surrounding districts, and had also seen the requisition signed by 518 of the inhabitants asking for gas as soon as the mains were extended. As a result of his examination, he made the report set out in the prospectus, the statements in which were true in every respect, and were borne out by the facts. It was absolutely impossible that Mr. Anderson could have made in one day a complete inspection of the gas-works and the district; and therefore his statements were reckless and unreliable. There were several large mansions in the district which might be expected to be big consumers; and he maintained that his estimate of 50 million cubic feet per annum might be increased by at least 25 per cent. Then there was an affidavit by Mr. Pontifex exhibiting a statement made by Mr. Hyde, showing the profits during the year 1904 as £366, and that he seemed to have sold close on 3 million cubic feet of gas. Mr. Reynolds made an affidavit exhibiting the requisition signed by 540 persons.

Mr. HUGHES then read further affidavits on behalf of the applicants; the first one being by Mr. Andrew Dougall, who had been in charge of the Tunbridge Wells Gas-Works for 25 years. He had, on July 2, visited Goudhurst, inspected the gas-works, and made a report. It was entirely an agricultural neighbourhood; and of the numerous important adjoining districts referred to in the prospectus, there was not one to which it would be worth while to take a supply of gas. These districts were included in the parish of Goudhurst, and were not in addition thereto. Of the various places described as "districts" which could be supplied remuneratively by the present works, only two could lay claim to such a title; the others being simply farm-houses. Mr. Dougall gave the figures of the population, and said that no one with practical knowledge of gas supply could ever estimate that a consumption approaching the figures named in the prospectus could be obtained in such a district. In his opinion, it would be a liberal allowance to take 10 million cubic feet per annum as the possible future consumption to be attained by the Company. If one accepted the figures put forward in the prospectus, the profit would not be £6853, but at most £1370. In conclusion, he gave instances of similar companies, one of which was Hawkhurst, where the population in the district was 3274, and the gas made 6,400,000 cubic feet a year. The profits made during the last four years varied from £240 to a little over £300. It would involve a very large expense to lay mains as was suggested.

Justice JOYCE asked if the Company were not liable to be indicted if they laid a main in a public road unless they had statutory power?

Mr. HUGHES replied that he did not think they could do anything without first getting a Provisional Order.

Mr. GORE-BROWNE thought they could with the consent of the Local Authority.

Justice JOYCE said not if it was a nuisance. The breaking up of a road was a nuisance, though, if it was very temporary, it might be allowed.

Mr. HUGHES then read an affidavit by Mr. H. E. Jones, for 36 years Chief Engineer and General Manager of the Commercial Gas Company, who had inspected the works. His opinion was very similar to that expressed by the other expert witnesses.

Mr. GORE-BROWNE next read a further affidavit by Mr. Harrap, who adhered to his former views, and said that the statements made by Mr. Dougall were inaccurate and misleading; that the district was far from being exclusively agricultural; that it was largely patronized as a health resort; and that there were many high-class residential properties in the neighbourhood. He repeated that his estimate was a fair and reasonable one, and said that Mr. Dougall's statements were probably prejudiced by his connection with a rival Gas Company.

Mr. HUGHES read a further affidavit by Mr. Darwin, in which he went more into detail than he had in his first affidavit. Also an affidavit by Mr. G. P. Hymes, of Goudhurst, who was for years a Director of the Goudhurst Gas Company, and a solicitor. He exhibited a balance-sheet of the Company giving the figures stated by Counsel in opening. He said he had lived at Goudhurst all his life; and he confirmed the statements made by Mr. Dougall as to the nature of the district. He also stated that it was impossible to enlarge the present works, as they were surrounded on three sides by the property of gentlemen who would not sell, and on the fourth side by the high road.

Mr. *S. B. Darwin* was then cross-examined by Mr. GORE-BROWNE. He said he had got into communication with the promoters through an advertisement before the Company was registered. He signed the Memorandum and Articles of Association. He was assured by the promoters that the scheme was everything he could possibly wish for. On May 3, the prospectus was considered. He did not read it from beginning to end, but simply glanced at it, because there was a lot of stuff relating to dividends by different companies. He read the parts relating to Goudhurst. The amount of gas which could be supplied was not mentioned, to his knowledge, except that there were 400 applicants for it. He read Mr. Harrap's report; and he was assured that all was correct. He had his doubts about the estimate of 50 million cubic feet as a modest computation. The prospectus was in print; and no doubt it had been already drawn before ever he saw it. He signed a copy of it. He had no knowledge of the district. In the *agenda* book he wrote the resolution adopting the prospectus; but he was assured this was a purely preliminary matter, as there was no Secretary. A Secretary would, it was said, be appointed later on, and then a minute-book would be provided and another meeting held to enter this so-called minute. Being shown a previous minute or resolution in his own handwriting on the same page: "Resolved—that the Secretary be L. Thompson and the Registered Office be at Parliament Chambers," he said no doubt he joined in appointing him; but he did not know the Secretary was appointed, and to his knowledge he never saw any Secretary. He saw two Directors and two promoters, and a gentleman who he understood was the Engineer. Between May 3 and 14 there was nothing, except the expense, to prevent him going to Goudhurst if he wished. The Company was registered on May 2; and he attended a Directors' meeting the next day and authorized the issue of the prospectus. He assumed, from what he had since learnt, that he was morally bound to tell the truth in the prospectus. The prospectus came out on May 14, and was largely advertised. He did nothing on May 14 or 15. He did not see the advertisement, because he was in Brighton. On May 15, he learnt that the prospectus was being largely advertised; and the next day, directly he reached home, he wrote to the papers about the unwarrantable use of his name. Witness was very severely cross-examined as to his use of the word "unwarrantable,"

when he had already signed the prospectus, and had concurred in the resolution that it should be published on a certain day. Ultimately, he admitted that he became frightened on seeing that the Company were being attacked in the newspapers. On May 19, he reached the office a few minutes after twelve, and went up to the top of the steps, where he met one of the promoters whom he had been accustomed to call Lawson, but was told his name was Gyde. He then went into the office and saw the two promoters and the other two Directors.

Justice JOYCE asked what were their names.

Witness replied that he only knew the promoters by sight; and the two Directors, to whom he had been introduced at a previous meeting, he did not know by name. He then referred to the prospectus to refresh his memory as to the names of Mr. Archer and Mr. Burgess. He did not know if he could recognize them if he saw them in Court. They appeared to have come to a meeting. They asked him to sit down; and he replied, "No, I am not going to sit down." Just then a lady knocked at the door, and demanded her money back. He did not see her; but he heard her voice, and someone rushed out to the door. He told them he had come to resign his post as a Director. They begged him to remain; and asked him if he would withdraw, and go down to Goudhurst on the following Monday. He replied that he had come to resign, and would have no more to do with the Company. He swore that he said that in the presence of Archer and Burgess. He did not think either of them said anything. Nothing was said about considering the matter for a few days, or four days. He got up from the table, and left the room. He thought it was imperative to sever his connection with the Company, as he was alarmed at the position of affairs. He did not think it was necessary to send a written resignation; but he communicated immediately with the papers, and went to the "Financial Times" office and saw the Editor. He wrote on the 19th; but his letter was not published till the 22nd, because the 20th was Sunday. He wrote it on the Saturday evening, and it was posted at Petersfield. He said in the letter that he had been misled. When at the office on the 19th, one of the promoters challenged him, and said that he was being led by the "gutter press," and certain other things which he did not wish to repeat. He did not really know who it was; but in the first instance he saw Scott and Co. Then some weeks after it came to Lawson and Co.; but the gentleman whom he called Lawson for some time he was afterwards told was named Gyde. He did not ask for his Director's fees on May 19. On May 28, he received an intimation of another meeting of Directors, but took no notice of it. On June 1, the Secretary wrote him that it was reported that he (witness) had resigned, but that the Company had received no information of it. He answered on June 3 saying that on May 19 he had unreservedly resigned his position as Chairman. On June 8 the Secretary wrote that his statement was not in accordance with the facts; that he asked for a few days, and afterwards for four days, to consider the matter; and that he was surprised not to have heard from him, as up to the present time there had been no absolute resignation received by the Company. On June 15, he wrote saying that on May 19 he severed all connection with the Company. He said nothing about taking four days to consider the matter, because nothing of the sort happened; and if he had made such a remark, he should have admitted it.

In re-examination, witness gave details of his reading the advertisements, and the parties he saw at various stages of the transactions. Mr. Gyde, he thought, seemed to be the one managing the affair. The newspaper articles which he saw on May 16 pointed out that in the view of the writer the prospectus was not true.

Wednesday, Nov. 28.

At the sitting of the Court this morning,

Mr. GORE-BROWNE said he should be content to leave the expert evidence as it stood on the affidavits, without cross-examination; but, of course, he must not be taken, on that account, to admit the statements made.

Mr. *Charles Archer* was then called, and cross-examined on his affidavit by Mr. HUGHES. He said he was till recently a general merchant; but at present had no occupation. He had not had any experience in connection with gas matters. He had known one of the promoters—Mr. Darby—for some years. He was a company promoter in partnership with Mr. Gyde. He did not know him until a few weeks prior to the bringing out of this Company. Messrs. Darby and Co. bought the Goudhurst Gas-Works from the former Company in October, 1904; trading in this matter as F. C. Lawson and Co. He did not know that they used this name in connection with any other business; but it was up on the office at Parliament Chambers. This was the office of Messrs. Darby and Co. under the name of Messrs. Lawson and Co. He was asked to become a Director a few days prior to the first preliminary meeting, which was, he thought, on the 30th of April. There were three preliminary meetings, at which all the Directors met. Mr. Burgess, his co-Director, was until recently a contractor, when his health failed. He knew nothing about Goudhurst at that time, but he had been there since. He knew nothing of Mr. Harrap, and did not instruct him to make any report upon the property. He saw Mr. Darwin's letter of the 16th of May to the Secretary, saying that his name had been unwarrantably used in connection with the prospectus, but not on the day it was received—probably on Saturday, May 19.

Justice JOYCE asked for the minute-book of the preliminary meetings, and also the *agenda* book; and they were produced.

Mr. HUGHES read from some of the minutes. The first minute of the Directors' meetings seemed to have been made on the 3rd of May; but witness said that before that date there were preliminary meetings, when the Directors and the promoters were present, and also the Secretary, *pro tem.*, Mr. L. Thompson, who was appointed at the meeting of the 3rd of May, but only temporarily. At the same meeting, the minute showed that the prospectus was considered; and it was resolved that it should be approved, and issued on the 14th of May. The witness said the prospectus was discussed at all the three preliminary meetings; that every word was read, and alterations were made. It was in rather a rough state at the first meeting; he believed it was prepared by the promoters. On the 3rd of May there was a discussion as to when they should go and see the place; but no one mentioned any particular date. If it had been pressed by anyone, he thought they would have gone straight away. It did not strike him that it was desirable to see if there were any gas-works at Goudhurst; he was quite convinced of that by the report of Mr. Harrap. Mr. Darwin said: "I suppose we shall go down to see it." To this, witness assented; but no particular time was mentioned. They had before them the report on the existing works; and they talked about future developments. When they spoke of going to Goudhurst, Mr. Darwin did not make it clear that he wanted to go there before the prospectus was issued or the allotment made. Witness did not see that it was their business to go to Goudhurst before they got money from the public. They relied upon the two reports by Mr. Harrap and Mr. Parker; the latter being simply arithmetic based upon Mr. Harrap's report. No suggestion was put forward that they should not rely on Mr. Harrap's report because he was instructed by the promoters; and Mr. Darwin appeared to be satisfied. He had not before had any connection with Mr. Darby in company promoting. He knew nothing about the West Suburban Gaslight and Coke Company, or whether Messrs. Darby and Co. promoted it. On the 19th of May, he reached the office about twelve o'clock, and found Mr. Burgess there; and afterwards Mr. Darby, Mr. Gyde, and Mr. Darwin entered the outer office together. At a quarter past twelve they were all there. He understood they were going to allotment that day. The list was advertised to be closed on or before the 21st; but he had personally asked that the meeting should be on the Saturday rather than the Monday, as being more convenient to himself. The list was not closed on the 19th, and they had had applications for shares since. In any case, they would have allotted on the Monday. It was suggested that the allotment should be made on the Monday; but he preferred that it should be on the Saturday. He was in the inner office, and he heard Mr. Darwin talking to Mr. Darby and Mr. Gyde. It was one large office divided into two by a partition which did not reach to the ceiling. There was a lady there at the same time. He heard Mr. Darwin discussing whether or not he should continue in his position, but he did not say on what grounds; and he ultimately left the office asking distinctly for a few days to consider the matter. He did not repeat then what appeared in his letter of the 16th of May—not in witness's presence. Witness and Mr. Burgess were in the inner office, and Mr. Darwin was in the outer one discussing with Mr. Darby and Mr. Gyde. He did not hear Mr. Darwin say that he would have no further connection with the Company. The promoters then came into the inner office, and discussed what Mr. Darwin had said to them. Mr. Darwin's name was put in the prospectus as the one man experienced in gas matters. Nevertheless they, in his absence, allotted the shares. He understood that two Directors formed a quorum.

Mr. HUGHES pointed out that there was no provision in the Articles of Association as to a quorum.

Witness (continuing) said he had no reason to suppose Mr. Darwin intended to sever his connection with the Company; and, though he was Chairman, they went on with the business in his absence because they felt they were justified. Mr. Darwin's complaint was as to his remuneration; he asked for his fees before any other Director did. He (witness) did not know at that time that there had been an article in one of the financial papers attacking the prospectus; but he heard of it afterwards. At that meeting none of them knew of it, so far as he was aware. He had never seen the article in the "Financial Times" attacking the Company. He had seen a small cutting from one of the papers, but not the paper which had since been referred to. He heard a reference by Mr. Gyde to the "gutter press;" so he knew that what had been called the "gutter press" was attacking the Company. But this was not why they were in such a hurry to allot. He took the chair; and he particularly put the question as to whether they were a quorum.

Justice JOYCE asked what discussion took place before the allotment.

Witness described how, when they found that Mr. Darwin did not remain at the meeting, he and Mr. Burgess inquired whether they could proceed with the business in his absence, with the Secretary *pro tem.* and the promoters; and he was assured that they could—that, either under the Articles of Association or the prospectus, two Directors formed a quorum. It having thus been settled that they could go on, they proceeded to consider the applications; but he could not be sure who suggested the allotment.

Mr. HUGHES then read from the *agenda* and rough minute-book of the meetings that the first business was to approve and adopt the agreement of the 18th of April between F. C. Lawson and Co., and Charles Archer, as Trustee for the Company; the next, to consider an application from Mr. Reynolds to join the Board; and, thirdly, "to consider the following applications for shares." At the end appeared this: "Resolved that the said shares be, and the same are hereby, allotted."

Witness said that when the promoters put before them what Mr. Darwin had said, they immediately considered whether they could allot; but he could not be sure who spoke first. He believed that Mr. Darwin would attend subsequent meetings. He knew that Messrs. Darby and Gyde were to get £21,800 for the property, as appeared by the agreement. But there were big expenses attaching to it; they paid all the expenses of floating the Company. He knew that Messrs. F. C. Lawson and Co. meant Messrs. Darby and Gyde. The discussion was principally between Mr. Burgess and himself.

Justice JOYCE: Did you take Mr. Burgess's advice, and did he take yours?

Witness replied that they two and the Secretary discussed matters. He did not know the Secretary previously. They approved the agreement; and, on the basis of the reports, he regarded £21,800 as a proper price. He did not personally consider at that meeting whether or not it was a proper price. With regard to the last portion of the resolution—viz., "That the Solicitor be instructed to prepare a novation"—he did not know exactly what it meant; but when they discussed the matter, it was explained to him that it must pass from one firm to another before it could be sold to the Company. Beyond that, he could not say that he understood it. The application from Mr. Reynolds was considered; but he did not know then that Mr. Reynolds was the gentleman who had canvassed the inhabitants. He had since been appointed a Director. Then the last resolution was: "After

due consideration, it was resolved that the said shares be, and the same are hereby, allotted." Witness was asked what was the "due consideration" before allotting. He replied that they had the applications before them, and some of them were not in order. He took it that "due consideration" was, more or less, a technical phrase. Totalling up the applications, they came to about £29,000; and they anticipated more money would come in. The list was not closed, and they did not expect all the applications to be in on the Monday. They did not consider how much capital they would have left (after paying in cash all the purchase-money) for the "enormous" extensions. They concluded that they might make a second issue for more capital, if necessary. The prospectus said they would not go to allotment under 50 per cent. of the total capital; but they had then received more than that. The next item on the *agenda* was: "Applications for withdrawal considered, and it was resolved that the Secretary be instructed to prepare lists of withdrawals, in order to return deposits and for the cancellation of applications received prior to allotment." He could not be quite sure how many there were, but they were all entered; and at a subsequent meeting they resolved to return the money to the applicants who withdrew before allotment. Their number then was 17. He did not know why they withdrew. Most of the communications were telegraphic; and they did not disclose any connection with what was in the "Financial Times." Several applications were coming in at the time of the allotment; but they were thrown on one side to be dealt with afterwards. There was another meeting on the 21st of May, when the minutes of the previous meeting were read and confirmed, and it was then adjourned to the 22nd. At that date they knew of the attack on the Company in the financial papers. He thought Mr. Burgess drew his attention to one little article. On the 22nd they allotted further shares. The Secretary produced a list of the applications withdrawn; and cheques were ordered to be made out for the amounts to be repaid. The appointment of Mr. Reynolds as a Director was next considered, and he was elected. He thought Mr. Reynolds was nominated by Mr. Burgess. On the 23rd of May there was another meeting, when an application from the vendors was considered for the payment of a deposit on account of the purchase-money; and, after consideration, it was resolved: "That cheques be drawn for £4360, being 20 per cent. of the purchase-money." Under the agreement, the balance was to be in cash or shares at the option of the vendors. On the 28th of May, Messrs. Lawson and Co. having reported that they would be ready to hand over the property on Thursday, the 7th of June, it was resolved that arrangements should be made to meet them at Goudhurst, and that a cheque should be drawn for £10,000 on account of the purchase. Letters from numerous shareholders claiming cancellation of their applications on account of the reported resignation of Mr. Darwin were read; and it was resolved that answers be written that up to the present date no letter had been received from Mr. Darwin resigning his position as Chairman, and that the Directors had no power to cancel any allotment of shares after they had once been made. They did this on the advice of the Secretary. Witness, Mr. Reynolds, and the Secretary talked it over, and they came to the conclusion that they had no power to do such a thing. They did not take any legal advice on the subject. When he said they had not received any letter of resignation from Mr. Darwin, he did not consider that this was evading the whole point. He did not know that Mr. Darwin had severed all connection with the Company; he had not seen his letter in the papers, though he had heard of it. He thought Mr. Burgess told him of it, and the promoters might have discussed it; but he did not know of it till some days after. Mr. Burgess discussed it with him, but not on the day it appeared; and he did not ask to see it. He did not see the "Financial Times" once in six months. When he was told of the letter, he thought he asked for the cutting, and then he saw it. He had been to Goudhurst since then, and found it a nice residential locality. There were three or four very big houses; but he could not say what was the total number of houses in the district. No doubt, the great majority were labourers' cottages.

In re-examination, witness said that on May 19 he was in the inner room; and he heard Mr. Darwin discussing with Mr. Darby and Mr. Gyde outside in a sort of half office. The greater portion of their conversation was in an undertone, and he only occasionally caught any words; but he attached little importance to them. There evidently had been some talk of considering the matter as to whether Mr. Darwin would remain. He heard it mentioned that he wanted a few days to consider the matter. The conversation was practically all in the outer half office. The partition did not go right up to the ceiling, or he should not have heard anything. The conversation did not last more than five minutes. The Secretary went forward to speak to a lady. Mr. Darwin did not come into the room where Mr. Burgess and he were sitting at a table; he stood in the opening. He did not say anything to witness or to Mr. Burgess; he made no communication to the Directors as Directors. According to his understanding of what passed, Mr. Darwin did not at that time intimate that he resigned or that he severed all connection with the Company, or said definitely what he was going to do. No doubt witness's attention was called to Mr. Darwin's letter of May 16 on that day; but he could not be sure whether it was before or after the Directors' meeting. The meeting lasted until 4 o'clock. The resolution to allot was passed within a few minutes of the commencement of the business; and he did not think he had seen the letter before that. He was positive he saw no newspaper cuttings before the meeting. In adopting the prospectus, they had before them Mr. Harrap's report, and had no reason to doubt its accuracy. He was assured by the promoters that Mr. Harrap was a thoroughly capable man. On three occasions they read the prospectus through word by word; and Mr. Darwin made no objection to any portion. The requisitions from people to the number of over 500 asking for gas were before them; and he thought there was a great scope for supply in the district. Previous to May 19, Mr. Darwin's objection had been about his remuneration—not its rate, but as to his expenses; and he wanted to know when his remuneration would commence. Before proceeding to allotment, they made sure that there were applications for more than 50 per cent. Mr. Thompson, the Secretary, seemed to understand Company matters. The promoters undertook all the preliminary expenses, and guaranteed the interest for the first year. A letter of June 8 from the Secretary to Mr. Darwin was read. It commenced by saying: "In reply to your letter of the 3rd inst., my Directors instruct me to write and inform you;" and the witness admitted having instructed the Secretary to write it. But, with regard to a statement in the letter that at the interview on May 19 Mr. Darwin asked first for four days, and then for a few days, to think the matter over, which the other Directors agreed to, he did not think he instructed the Secretary to put in the last words. They did not settle the terms of the letter, but told the Secretary to write. This would appear in the minutes. [On the minute-book being referred to, it appeared that the whole letter was set out, and that a verbal alteration of the word "severally" to "individually" was initialled by witness.]

Mr. HUGHES: Do you mean to deny that you knew, when you were a party to the allotment of the shares, that there was, at least, a serious question whether Mr. Darwin was going on as a Director at all?

Witness: No; but I did not attach much importance to it. He wanted a few days to consider the matter.

Then you knew there was a serious question?—Yes; but I believed he would continue, because he had taken a very active part in every discussion previous to that.

Mr. *G. T. Harrap* was next cross-examined on his affidavit, in which he verified his report. He said he had had very little experience with regard to gas matters. He was instructed on June 15, 1905, by Messrs. Darby and Co. to inspect the Goudhurst Gas-Works. He did not at that time know them, but he had met two gentlemen—Mr. Darby and Mr. Gyde. The instructions were verbal. He was paid by cheque soon after he sent in his report, which was about two or three weeks before the prospectus was issued. He had no communication with the Directors. He went to Goudhurst on June 15, 1905, and again on Jan. 10 and Feb. 6, 1906. His report was addressed to "The Directors of the Kent County Gaslight and Coke Company," and commenced "Gentlemen, Having, according to your instructions." This was untrue, unless he assumed that Messrs. Darby and Co. were acting for the Directors. When he was instructed in June, 1905, they told him they were going to buy the concern; and he was asked to make a report for the purpose of the prospectus—the instructions having been originally from Messrs. Darby and Co.—before they bought the property. He knew they were buying with a view to selling to a company. He saw the books, which were produced by the late proprietor, Mr. Hyde; and the make was something over 3 million cubic feet. With regard to his statement that there were great facilities for extending the existing mains, his only justification was that it could be done. The fact that they had no statutory powers had nothing to do with him. What he meant by "facilities" was that these places were handy and the mains could easily be connected up. There were several mansions near, and a large ladies' school. He did not ascertain that one of the mansions was supplied with electric light; and he could not recollect the names of the large houses. He looked through the requisitions, and took out a few names. There was a public hall, schools, laundries, ladies' college, and so on. When he said there were "good residential as well as shopping districts within a reasonable distance also waiting to be supplied," he meant to include Horsemunden and Lamberhurst. He had heard since then they were within the area of supply of another gas company—the Mid-Kent. Any village with two or three shops, he termed a "shopping" district. He saw a large number of requisitions. Witness was then taken through a list of the whole of the places mentioned in the prospectus, which he identified on a large-scale map, one of them being identified by its being the site of an old sand pit, and another as an old quarry. The report spoke of the results of interviews with the inhabitants; but he himself had no interviews, he wrote from information. He had seen signed sheets, to the effect that the people would use gas-stoves. He adhered to his view with regard to the sale of 50 million cubic feet per annum. His recollection was that he made it about 65 million feet, and took 50 million feet as being an even figure well within the mark. He did not judge by the number of houses, but by the character of the residences. He had no idea of the average consumption per house at Tunbridge Wells or anywhere else. Averages were very deceptive. He took 518 requisitions as representing about one-fifth of the people. Lamberhurst and Horsemunden represented over two-thirds of the anticipated consumption. They were not named in the prospectus, nor referred to; but they were included in his calculations, and in his mind they were the most important districts. They were not named because they were outside the parish. He was under the impression that nothing was to be mentioned that was outside the parish; but, for estimating purpose, he included them. He thought the figure he took was about £4 10s. per annum. The present consumption was some 3 million cubic feet; and there were about 100 consumers. At that rate what it would take to make up the 50 million feet was a mere question of arithmetic; but it would not be a fair comparison. The average consumption at Broadstairs was considerably in excess of that at Tunbridge Wells. He did not consider, in relation to any one of these districts, whether it would be worth while to lay down mains. He was not asked to go into any estimate of the cost of extensions, either for taking mains into the districts or for erecting works to produce 50 million feet. He had nothing to do with the promoters of the Company, but simply to give a report as to the possible total consumption of gas in the district, for the purpose of the prospectus. He did not see the prospectus until after the litigation commenced.

Mr. *Richard Reynolds* was then cross-examined. He said he was now one of the Directors, having been appointed at the end of May, 1905. He did some of the canvassing of the district and got requisitions signed. He applied to be appointed a Director—not on account of his services in canvassing, but because he thought that, if there was a vacancy, he should like to join the Board. He knew Mr. Darby, but not very well; he had met him about a year before. Witness was also a Director of another Company brought out by Messrs. Darby and Co.—the West Suburban Gaslight and Coke Company, which was formed in July, 1905. His description and address there were given as "No. 15, Park Lane, Gas Engineer." He knew a good deal about gas engineering, and had had the management of the gas-works at Colnbrook—the West Suburban Gas Company. That Company was floated with a capital of £30,000. It was now in voluntary liquidation, and had been bought

up by the Uxbridge Gas Company. Many applications came from Lamberhurst. He did not ascertain whether Lamberhurst was within the district of any other Company; but he had since heard it was. He saw gas in Lamberhurst when he was there. He believed it was in two parishes; and a certain part of it was already supplied with gas. It was developing rapidly. He had been told that Goudhurst was not developing; but he knew there were never houses to be let, and when any were built they were at once taken.

Re-examined by Mr. KIRBY: A very small part of Lamberhurst was lighted with gas. Only just on the top of the hill.

Mr. HUGHES stated that he should not require to cross-examine the other witnesses.

Mr. KIRBY (in the absence of Mr. Gore-Browne) then addressed the Court on behalf of the respondents; urging that there had been no misrepresentation, and that it was not a question between the applicants and the Directors, but between them and the other persons who had taken shares. He submitted that Mr. Darwin had not ceased to be a Director at the time of the allotment.

Justice JOYCE at once gave judgment. He said: This is not an action for deceit and damages against the Directors and other persons who are responsible for the issue of this prospectus. It is an application, under section 35 of the Companies Act, to be relieved from the allotment of shares which was made to the applicants, and to be relieved really on the ground that it was not disclosed before the allotment that the facts had ceased to be as they were stated in the prospectus—in other words, that a material fact stated in the prospectus had become untrue. This prospectus is a most cunningly devised document. I do not think I have ever seen a prospectus more artfully framed to entrap the unwary and the inexperienced; and knowing now what I do know about this Company, and particularly about the history of the previous sale and purchase of the gas-works, I have no hesitation in saying that, in my opinion, the bringing out of this Company and palming it off upon the public was nothing better than a swindle, and that the public have been most grossly defrauded by somebody. If there be further litigation in reference to these matters, and it really be found out who is responsible, I shall be very much surprised, and I should think the person responsible will be fortunate if he succeeds in proving that he is not a knave and a cheat. The law, as I understand it, is that where a person is induced to take an allotment of shares by a material misrepresentation of fact in the prospectus, he is entitled to an order for rescission of his contract to take the shares, and the return of his money, and so on; and where a person seeks to rescind the contract to take shares on the ground of misrepresentation, it is not necessary that he should prove that if the misrepresentation had not been made he would not have taken the shares. It is sufficient if there be evidence to show that he was materially influenced in taking the shares by the misrepresentation. The case here is that non-disclosure of what had happened with reference to Mr. Darwin had the effect of making what was stated in the prospectus misleading, and was therefore sufficient to entitle the applicants to rescission. A passage in "Lindley on Companies," is to the effect that "if an application for shares is made on the faith of a statement which is true when made, but which is not true when the shares are allotted to the applicant, he may refuse to take them;" and I have no doubt that this is the law. This prospectus contains a particular statement with regard to Mr. Darwin, which is to the effect that "the Company will have the advantage of the services, as Chairman, of Mr. S. B. Darwin; this gentleman having been connected with the Portsea Island Gaslight Company for over twenty years. The dividends paid by that Company on their 'A' and 'B' shares for the past sixteen years have been 13 per cent. per annum." The prospectus is issued on the 14th of May; and, for some reason or another, Mr. Darwin became alarmed about it. It does not matter in the least what was the reason, or whether his quarrel with the Company was really as to his remuneration or his expenses or what it was. He went to the offices of the Company and there saw the promoters, and he saw the Directors on the 19th of May, before the allotment was made; and the promoters perfectly well understood, and, in my opinion, notwithstanding what has been stated before me, the Directors understood, that he was not going to continue his connection with the Company. Therefore this statement which is made in the prospectus was no longer true. At the very least, the Directors knew that there was a very serious question as to whether or not Mr. Darwin was to remain. I consider that the evidence which has been given before me in cross-examination of the deponents who have made affidavits on behalf of the Company is most unsatisfactory; and, although I had better not go into more details about this, in part of the evidence I think the statements were most unscrupulous. There may possibly be at some future time further investigations into this case, and I will say no more about it than this, that I think the Directors on the 19th of May, before they made the allotment, were aware that the statement in the prospectus was no longer true; and knowing what they did know, it was neither right nor honest for them to go on to make the allotments which they did make, I suppose under pressure from the promoters. Under these circumstances, the result is that these people are entitled to be relieved from their shares, and the usual order must be made.

Mr. HUGHES: Their names are struck off the register, and they get their money back with 4 per cent. interest, I think.

Justice JOYCE: Yes.

Friday, Nov. 30.

At the sitting of the Court to-day,

Mr. HUGHES applied *ex parte* for an injunction to prevent the moneys of the Company being parted with in the payment of dividends until the applicants had received what they were entitled to under his Lordship's judgment—viz., the return of their application money with interest and the costs of the motion. Notices had been sent out, dated Nov. 23, saying that cheques for the guaranteed interest on the preference and ordinary shares due on Dec. 1 would be posted on the 30th. There was strong reason to believe, though the evidence was not very complete at present, that it was proposed to pay this interest out of money standing to the Company's account; whereas, according to the agreement, the liability was on the vendors and promoters. He asked for an interim injunction, and leave to serve short notice of motion (say) for Monday.

Justice JOYCE asked if there was a new action or summons, as he had disposed of the motion.

Mr. HUGHES said that the motion was headed "*In re* the Companies Acts," &c., as before.

After a short discussion,

Justice JOYCE said he did not see his way to make any order until some further proceedings were commenced.

Fire through the Fusion of an Electric Wire.

We learn from the "Reading Standard" that there was an alarming occurrence at the Broad Street Congregational Chapel on the evening of Sunday, the 25th ult. During a concert which was being given by a Welsh choir, the electric lights began to flicker violently, then they failed, flashed up again, and finally went out, plunging the whole chapel into darkness. The Pastor (the Rev. W. J. Farrow) at once sprang up, and appealed to the congregation to keep their seats. A solo was in progress, and the singer finished it in the dark, which helped to maintain the confidence of the timorous. The cause of the trouble was found in the entrance lobby. Fusion of a wire had taken place over a large lantern containing a cluster of lights, and it had fired the wooden casing of the wires. The flame, a few inches long, was springing up to the covering of woodwork and glass from which the lobby receives its natural light, and a shower of sparks fell to the floor. One of the Stewards mounted a table and endeavoured to extinguish the fire with the aid of a stick; while others fetched water. Within a minute or two the danger—which was a serious one, because the strong current of air would have quickly fanned the flames and spread them among the woodwork—was averted, and the electric current was switched off. Inside the chapel, the reserve gas-jets under the galleries and near the organ had been lighted up; and in the dim light the concert was brought to a speedy termination, and the large congregation dispersed with quiet orderliness.

Strengthening the Honor Oak Reservoir.

The Metropolitan Water Board had before them at their last meeting a report from the Works and Stores Committee in connection with the construction of a covered reservoir at Honor Oak, which the Board approved in August last year. They said they had had a report by the Chief Engineer (Mr. W. B. Bryan, M.Inst.C.E.), from which it appeared that at the southern end of the reservoir the outer walls approached within 30 feet of the South-Eastern Railway; the level of the bottom of the wall being about 57 feet below the rail level. The whole of the subsoil was comprised of a light yellow clay, with sandy partings; the bottom only of the foundations of the reservoir being in the blue clay. This upper clay had shown a very strong tendency to slide to the northward; and, since the trench for the reservoir had been opened, the pressure on the timbering had been found to be very considerably in excess of that estimated. It was only as the excavations progressed, and the ground was opened up, that the character of the subsoil was fully revealed. The South-Eastern and Chatham Railway Company stated that their boundary had also been shifting northward for a considerable period. The Chief Engineer had suggested that the reservoir should be strengthened at the southern end. The estimated cost of this was about £5500. The fact of the land shifting towards the northward was, in the opinion of the Committee, a very serious matter, and they thought that all possible steps should be taken to strengthen the reservoir at this point. The estimate approved by the Board in respect of the construction of the reservoir (£160,000) was sufficient to cover the additional expenditure; and the Committee recommended that their action in instructing the Contractors to carry out the extra works should be approved. The Board adopted the recommendation.

Public Lighting in East Ham.

At a meeting of the East Ham Town Council held last Tuesday, a return was submitted showing the comparative cost of public lighting during the six years to March 31, 1906. The conversion of the ordinary flat-flame burners into incandescents commenced in May, 1901, and was completed in August, 1903; but for comparative purposes the cost is excluded from the return. In 1901, the cost of gas lighting in the district was £5004. Of this, the West Ham Gas Company received £4004, and the Gaslight and Coke Company £863. In 1902 the cost of gas lighting was £4858. This was the first year in which a charge for electricity appears in the accounts for street lighting, and it amounted to £1568. The succeeding years were: 1903, gas £4496, electricity £2847; 1904, gas £3890, electricity £3519; 1905, gas £3945, electricity £3789; 1906, gas £4055, electricity £3861. Of the £4055 paid in respect of gas in 1906, £1726 went to the West Ham Gas Company and £445 to the Gaslight and Coke Company. The number of gas-lamps in 1901 was 1210, and there were no electric lamps. In 1902, there were 1158 gas-lamps, 120 electric arc lamps, and 16 glow lamps. In the succeeding years the figures were: 1903, gas-lamps 1046, arc lamps 169, glow lamps 134; 1904, gas-lamps 1204, arc lamps 171, glow lamps 139; 1905, gas-lamps 1245, arc lamps 193, glow lamps 111; 1906, gas-lamps 1265, arc lamps 195, glow lamps 110. The rates of payment to the Gas Companies per lamp per annum last year were as follows (the figures in parentheses are the rates paid in 1902; but these include lighting, cleaning, repairing, &c., which are not comprised in the figures for 1906): West Ham Gas Company—Ordinary lamps, £1 14s. 8d. (£4 3s. 6d.); two-flame lamps, £2 5s. 4d. (£8 7s.) Gaslight and Coke Company—Ordinary lamps, £1 8s. 2d. (£3 10s.); 4½ cubic feet incandescent lamps, £1 16s. 10d. (£3 8s. 2d.). The rates for payment for lamps supplied with electric current were as follows (the prices being the same in 1902 and 1906): Arc lamps (including lighting and maintenance) £18, glow lamps £4 6s. 3d. per lamp, of which 18s. 6d. is allowed to the Borough Engineer's Department for lighting, cleaning, and extinguishing. The Works Committee considered the statement as regards the reduced cost of street lighting by gas highly satisfactory; and the Council concurred.

EUROPEAN GAS AND ELECTRICITY COMPANIES.

Recent issues of French and German papers have contained the following particulars in regard to some European gas and electricity undertakings.

The Compagnie Générale du Gaz pour la France et l'Etranger, the ordinary share capital of which amounts to £800,000, have gas-works of their own in addition to being financially interested in other undertakings of a similar character. At the recent meeting held in Paris, it was decided to pay a dividend at the rate of 26s. per share out of the total profits, which slightly exceeded £94,000 for the year 1905-6—the rate of distribution being the same as it was in the preceding year. The extension of business is bringing about increased expenditure, while at the same time considerable plant is needed for the Company's electricity works. A new agreement has been entered into with the municipal authorities of Bucharest for a period of 40 years, and it provides for doubling the consumption of gas simultaneously with an enlargement of the works. The agreement also contemplates the erection of a central electric light station of a capacity sufficient to serve a town of 300,000 inhabitants. In the circumstances, it is essential to make a fresh increase of capital to meet the additional expenditure; and it has been decided to issue 10,000 new £20 shares, which will bring up the total ordinary capital to £1,000,000. The Directors have also been authorized to create a fresh issue of bonds as required, raising the total of this class of capital to £480,000.

The Directors of the Compagnies Réunies Gaz et Electricité of Lisbon, in the course of the report for the year ended June 30 last, state that the sale of gas increased from 27,865,000 cubic metres in 1904-5 to 28,112,000 cubic metres in the following year; while that of electric current rose from 779,270 to 1,507,721 kilowatt-hours. During the year, the Company continued the work of renewing and extending the installations, especially the electrical plant at Boa-Vista and the new gasholder of 20,000 cubic metres capacity at Pedroucos. The last report of the Porto Gas Company, in which the United Gas and Electricity Companies are interested, indicated that the working of the former had further improved during the year; and the same observation applies to the United Companies' concession at Sétubal. One of the items in the accounts, on the assets side, relates to municipalities, and shows a large increase over the preceding year. The Directors state that the greatest portion of this augmentation has occurred at Lisbon through the price of the municipal gas, which the Company invoice at half that charged to private individuals. But the town authorities believe gas ought to be continued to be supplied to them gratuitously. A settlement of the question is being resorted to by means of litigation. The accounts for 1905-6 show a net surplus of 399,923,031 reis; and a dividend at the rate of 7 per cent. has been declared on the ordinary share capital of 5,580,000,000 reis.

The report for 1905-6 of the Gas Industry Company (Gesellschaft für Gas Industrie) of Augsburg shows that the Company own eleven gas-works and two electricity stations, which are entered as being of the value of £365,500 on an ordinary share capital of £214,285. It appears that the work of gas supply has been discontinued at Salzburg and Innsbruck; but new agreements have been arranged in other towns. The consumption of gas slightly increased during the year, though the profits declined from £61,563 in 1904-5 to £56,320 in the past year. Nevertheless a dividend at the rate of 12·83 per cent. has been declared; being the same rate as that paid for 1904-5.

The New Gas Company (Neue Gas Gesellschaft) of Berlin, according to the Directors' report which has just been issued for 1905-6, had an increase in the total gas consumption during the year, notwithstanding the sharp competition of the municipal gas-works at Marienburg and Bernburg. The losses incurred in these two towns were more than compensated for by the gains in other localities, exclusive of the Russian works at Wilna and Cronstadt. It is pointed out that the number of ordinary and incandescent burners supplied showed a large advance. Gas-fires with the use of special meters also considerably increased; but a slight reduction took place in the number of those without special meters. The inverted incandescent gas-burner having been further improved, the report states that it can now be regarded as a method of illumination which meets all requirements in the matter of safety and reliability. It is a strong competitor of the latest forms of electric lamps having a low consumption of energy per candle power; and it has been rapidly appreciated by the public. The accounts of the Company for the past year show net profits of £17,099, against £18,837 in 1904-5; and it is proposed to pay a dividend of 5 per cent., as contrasted with 5¼ per cent. in 1904-5.

NOTTINGHAM GAS CONTROVERSY.

With an irresistible volume of public opinion in favour of the full disclosure of evidence recently given before the Special Committee of Investigation appointed by the Nottingham City Council to inquire into matters connected with the management of the gas undertaking, a resolution submitted yesterday by Alderman Fraser to a meeting of the Corporation was in the nature of an inevitable sequence of events. All that the general body of ratepayers, who are not versed in technicalities connected with gas manufacture and distribution, have asked for is that the whole case should be made known. This demand has been strengthened in formal manner by the circulation within the last few days of the petition which is referred to below. Yesterday Dr. Fraser's resolution was considered on the lines of a possibly declared inability upon the part of the Local Government Board to interfere in a matter which is obviously one for the Corporation themselves to deal with, and that in no uncertain manner. The resolution of the leader of the Liberal party read:

> That, in the event of the Local Government Board refusing to order a public inquiry into matters investigated by the Investigation Committee, the several persons who gave evidence before that Committee be requested to consent to such evidence being printed and distributed among the members of the Council; and that, such consent being given, the Town Clerk be instructed to have such evidence printed and distributed accordingly.

In support of his motion, Dr. Fraser said he understood that, since the last meeting of the Council, no reply had been received from the Local Government Board to the request that they should institute a public inquiry. After giving notice of his resolution, it had occurred to him that possibly, as witnesses who gave evidence before the Investigation Committee were not confronted with each other, and as there was no cross-examination, they might hesitate to allow their statements to be made public. He therefore proposed to add the following clause to the resolution:

> And that in the event of such consent not being given, this Council do institute a full public inquiry into the affairs and management of the gas undertaking, and that Sir Hugh Owen, or failing him Sir Albert Rollit, be requested to conduct such inquiry.

The speaker claimed that, by the proposals which he had brought forward in regard to the matter, he had exhausted all possible means of satisfying the public in regard to that which was a very unpleasant business. The motion was seconded by Alderman F. Radford, who formed one of the members of the Investigation Committee.

Sir John Turney, who presided over the Investigation Committee, appealed to Dr. Fraser to postpone his resolution until a reply had been received from the President of the Local Government Board. He said it might be that the Board would decline to institute an inquiry; and in that event the Council would be none the worse off, because it would then be open to them to consider the course that they should pursue. Mr. A. W. Black, M.P., also urged that no possible harm could result from deferring a decision until the Local Government Board's answer had been received. Dr. Milner supported Alderman Fraser's resolution, contending that the course therein purposed was the one which ought to have been adopted from the first. Mr. Sands, a former member of the Gas Committee, who resigned when Mr. Harlow relinquished the chairmanship, and who with him also gave evidence before the Investigation Committee, appealed to Dr. Fraser to eliminate from his resolution the sentence bearing reference to asking for the witnesses' consent to the publication of evidence. He said it seemed to him that it was hardly fair to ask them to give their consent to the publication of the evidence in its present form, as there had been no opportunity afforded for cross-examination. Dr. Fraser offered to withdraw his resolution if Sir John M'Craith, the leader of the Conservative party in the Council, wished it. But Sir John replied that he agreed with Dr. Fraser as to the course which he recommended for adoption. Ultimately the resolution was carried by an overwhelming majority—there being only six dissentients.

There had previously been a somewhat heated discussion, which eventually ended in matters being amicably arranged, in relation to the constitution of the new Gas Committee. The dispute centred upon the elimination from the Committee of the names of Dr. Milner and Mr. A. Ball, two Conservative members who had been left off because of alleged partisan feeling imported into the discussion of the affairs of the gas undertaking. On their assurance being given that they meant by their recent utterances nothing derogatory to himself, Dr. Fraser consented to retain on the Committee the two gentlemen named—Mr. Mellor and Mr. Cleaver withdrawing in their favour. In place of Sir John Turney, who had declined to serve, Alderman Mutch was chosen; the Committee being constituted as follows: The Mayor (Mr. J. A. H. Green), Aldermen Mutch, Ford, Jelley, and Truman, and Councillors Ashworth, Milner, A. Ball, Freeman, Loverseed, Sim, and Spalding.

Petition to the House of Commons.

A petition to Parliament is being promoted by the Nottingham Ratepayers' Association, praying that a public Government inquiry may be instituted to investigate the questions which have arisen with regard to the gas undertaking, and to ascertain "to what extent members of the Corporation act on Committees in the dual capacity of representatives of ratepayers and officials of Companies with which their Committees are dealing."

The petition, which it is intended should bear the signatures of "ratepayers and gas consumers of the City and County of Nottingham who are not actively engaged in party politics," sets forth—That for the last four years there have been grave causes of dissatisfaction with regard to the quality of the gas supplied and the price charged therefor. That from time to time numerous complaints have been lodged with the officials of the gas undertaking. That the matter has been brought before the Council on numerous occasions, and an expert has been called in twice without any effective remedy being found. That the gas has been admittedly adulterated. That the price charged varies from 30 per cent. to 50 per cent. higher than that charged by other gas undertakings. That allegations of a most serious nature were made against the Engineer by the late Chairman, which resulted in the resignation of several members of the Committee. That a Special Investigation Committee was appointed, which took its evidence in secret, and whose report gave no evidence that it had even considered the question of the bad gas and its price. That it has been shown that the Gas Committee have had dealings with Companies in which the members are officially interested. That a member of the Special Investigation Committee was a shareholder in one of the Companies whose transactions were investigated. That the reason afforded by the Investigation Committee for keeping its evidence secret, was that personal considerations were involved. The petitioners are therefore of opinion that personal considerations have prevented a satisfactory inquiry into the management of the gas concern.

Dangers of Electric Cables.—In Commercial Street, Sheffield, last Friday, when three tramcars were passing, one of the guard wires over the electric cables broke and fell across the "live" wire. The current was transmitted to the other guard wires, which instantly fused, and broken wires fell in all directions. One length of wire came in contact with a gas-lamp, fused the pipe, and set light to the gas.

GAS TESTING AND PUBLIC LIGHTING AT TOTTENHAM.

At a recent meeting of the Tottenham Urban District Council, the Public Health Committee reported having considered an application from Mr. A. E. Brown, the Gas Examiner, for an increase of salary for extra work involved in testing the gas for calorific power. Under the present arrangements, Mr. Brown's duties are to make one test per week for lighting power, impurities, and pressure, and he is paid £50 per annum, made up of contributions from the Councils of Tottenham, Wood Green, Edmonton, and Southgate. Under the Tottenham and Edmonton Gas Act of this year, the sulphur clause has been abolished; and consequently this part of the test is not required. But under the agreement between the Company and the Council, the former are bound to supply gas of a certain calorific power. The Gas Examiner informed the Committee that additional work is involved in consequence of this test having to be made at the gas-works, whereas the other tests must be carried out at the testing-station at Wood Green. He advised that an increase in the number of tests should be made, seeing that the Company's output is double what is was in 1899, when the present arrangements were made. The Committee recommended that, subject to the other Councils agreeing, the number of tests should be increased to two per week, and that Mr. Brown's salary should be raised to £100 per annum.

The General Purposes Committee reported having had before them draft contracts with the Tottenham and Edmonton Gas Company for lighting, cleansing, and extinguishing the public lamps, and for repairing and maintaining them till June 30 next. In view of the possibility that during the current contract with the Company the Council may desire to light some of the public lamps by electricity, the Clerk considered that a clause enabling the Council to do so should be inserted in the contract. In reply to an inquiry, the Secretary to the Company intimated that the Directors agreed to this, conditionally on not more than 20 per cent. of the lamps being discontinued, and that due notice should be given; also that, in removing any of the fittings belonging to the Company, the work should be done in sections. The Council's Engineer did not advise the removal of any gas-fittings. The Committee stated that they approved the contracts with the proposed new clause, and recommended the Council to seal them.

The consideration of both subjects was adjourned till the meeting of the Council last Tuesday, when it was decided to seal the contracts for the public lighting, and increase the number of gas tests to two per week—the Examiner's salary to be raised to £100 per annum.

THE ILFORD GAS COMPANY'S NEW OFFICES AND SHOW-ROOM.

At the half-yearly general meeting of the Ilford Gas Company, a report of which was given in our issue of Sept. 25 last (p. 843), the Chairman, Mr. William Ashmole, referred to the "new and much-needed offices and show-room in the Broadway," which were at that time nearly completed, and would shortly be ready for occupation. These have now been opened; and last Thursday evening a dinner in celebration of the event was given at Ilford by the Directors to all the staff—Mr. Ashmole presiding.

The building, which contains the show-room, central offices, and board-room, has been admirably designed and fitted, and occupies a prominent position in the busy part of the town. The large show-room front makes a most effective display, and when lighted forms a very attractive example of modern gas illumination; a large number of inverted burners hanging from the ceiling. There are besides other up-to-date methods shown of lighting by gas; and in addition the public can see the best means of heating and cooking. In fact, the Chairman succinctly described, at the half-yearly meeting, the scope of the new building, when he said that "the accommodation afforded . . . would enable the Company to practically demonstrate the many ways in which gas might be economically used under modern conditions . . . both from an artistic and utilitarian standpoint." At the back of the show-room are capacious desks for the clerical staff. A handsome staircase, with fine railings, leads to the first floor, where there is a beautiful and well-proportioned board-room, with gracefully arched ceiling, oak-panelling, and artistic fireplace and gas-fittings. Convenient retiring rooms and other offices adjoin the board-room. Altogether, both externally and internally, the new show-room is a very successful piece of work, and reflects great credit upon all connected with it.

At the dinner, Mr. Ashmole, in proposing the toast of the evening, "Prosperity to the Ilford Gas Company and Success to the Show-Room," gave an interesting and instructive historical account of the rise and development of the undertaking. It was one of the earliest to be established; for it dates from 1839, whereas many of the neighbouring gas-works only commenced in the year 1846. In 1873, the Company was incorporated by Act of Parliament, with a capital of only £5000. The present capital amounts to about £250,000. At first the price of gas was 15s., then in 1842 12s., and now it is 2s. 11d. per 1000 cubic feet; a reduction of 7d. having been made in the last three years, during the engineership of Mr. A. A. Johnston. The following interesting figures were also given by the Chairman, showing the great progress of the undertaking:—

Year.	Coal Carbonized.	Total Cost of Coal.	Gas Receipts.
1845	80 tons	£72	£282
1876	700 ,,	£617	£993
1906	22,770 ,,	£16,880	£45,000

During the last ten years, there had, he said, been an abnormal increase; and they were holding their own against a powerful competitor. It had been shown that for public lighting there was no better illuminant than gas. This was exemplified by the preference given to gas for use in lighthouses, as its penetrating power in fogs was greater than any other illuminant. Its success was also shown by its having been adopted for lighting the streets of the City of London and of Westminster.

Reverting to the new offices, the Architect (Mr. Dawson) and his Assistant (Mr. Allardyce) were highly complimented on the successful result of their labours, and upon making the most of a rather awkward site. The new building, it was said, was a credit to the town and to the Company. A local firm of builders (Messrs. Willmott) had admirably carried out the work. Reference was also made to the able heads of the different departments of the Company, and to their excellent and loyal staff.

Mr. Johnston, the Engineer and Manager, shortly and suitably proposed the health of the Chairman, who briefly responded.

At the conclusion of the dinner, at which between sixty and seventy persons were present, an admirable musical programme was gone through; and a thoroughly enjoyable evening was spent.

THE GAS INDUSTRY AND THE IRONMONGERY TRADE.

The Movement in Favour of Co-operation.

In a well-written article which appeared in the "Ironmongers' Chronicle" for the 17th ult., the question of co-operation between the gas industry and the ironmongery trade is considered from the point of view of the former. The following are extracts from the article.

The gas manager, like other busy men, does not welcome very readily any proposal for the introduction into his administrative mechanism of new machinery, entailing the taking of considerable thought and trouble upon its introduction, and the permanent addition of a certain amount of work to his already sufficiently onerous duties. Before he can be induced to look favourably upon, and to recommend to his Board or Gas Committee the adoption of, any such proposal, he must have it clearly demonstrated to him that the new departure has in it all the elements of success, and that it is certain to bring material advantage to his undertaking and credit upon his management. This demonstrated, he will then, if fitted for his post, welcome the proposal, and do his utmost to secure its adoption; if he does not, he must undoubtedly be regarded as an unworthy occupant of his office.

The ironmongery trade, through their Federation, are at the present time, and have been for some years past, urging the gas managers of the country to adopt the plan of concerted co-operation between their undertakings and the ironmongers doing business in their districts. This movement has now undoubtedly received great impetus from the fact that the premier gas undertaking in the kingdom—the Gaslight and Coke Company—has recently adopted such a plan, and has entered into a working agreement with a considerable number of the leading ironmongers trading within its area of supply. But there are doubtless still many gas managers up and down the country who require to have the advantages of such co-operation clearly set before and impressed upon them, in order to overcome the inertia of the natural man—an inertia which is, of course, more evident in some cases than in others. The smartest business man needs the least amount of force to start him on a new road; while the least competent needs a charge of dynamite to set him going.

In this article, however, we do not intend to concern ourselves with the latter class. Our aim is, rather, to put clearly before the receptive and enterprising gas manager the reasons why, in our opinion, it is worth his while carefully to consider the proposal that his company should join hands with the ironmongery trade in regard to the pushing of the sale of gas in his district. This can best be done, we think, by considering the reasons which presumably induced the Gaslight and Coke Company to take that step—for it cannot be denied that there were, on the face of things, reasons why that Company might have looked askance at the proposal, at this time of day, if the present management had not been capable of taking long and broad views of policy.

This great corporation, after many years of anxious struggle against competition—in the earlier of which years, it cannot but be admitted, its relations with the public were not altogether of the most cordial—has in recent times, by adopting a policy of giving its consumers prompt and businesslike attention, a thoroughly efficient and complete service, and every reasonable consideration, established a position in the esteem of the public which a few years ago would have appeared impossible.

In thus touching upon the history of the past few years, we are not indulging in the foolish pastime of rubbing old sores to no good purpose, nor do we desire to apportion blame to any one. We are merely setting out the facts which might have led the Gaslight and Coke Company to say, "What have the ironmongers done for us that we should do anything for them?" (which is, in fact, what some gas managers are still disposed to say) in order to throw them into greater prominence, and to show how much importance attaches to the fact that they, on the other hand, have said, "Let us do something for the ironmongers, in order to see what they can do for us; and let us make it easy for them to do all they possibly can."

That was, undoubtedly, a fair, and we believe it will be proved to have been a wise and far-seeing, decision at which the leading gas undertaking arrived. What led them to take it, in face of the facts we have set forth? They possess a number of fine show-rooms, an excellent organization for serving the public, and an increasing business, and are steadily advancing in favour with their customers. Why have they then inaugurated a system under which the ironmongery trade in their district will derive material advantages? Because, of course, although their position is a strong one, their business advancing, and their popularity on the increase, the management see plainly that this position will be greatly strengthened, their output will increase more rapidly, and their favour with the public will be still further advanced, if, in addition to their ten show-rooms, there are displays of gas stoves

and fires and attractive advertisements in the shops of a hundred ironmongers; if, in addition to their own staff, a hundred or more ironmongers and their assistants are acting as advocates of the use of gas; and if, instead of cherishing more or less active ill-feeling against them, these hundred ironmongers are their good friends and allies, who can help not only to bring in business but also by creating favourable public opinion.

The last-named consideration is of more importance than many gas managers realize. The effect upon a public supply company's business which is produced by the attitude of the general public towards it, is too seldom appreciated by its management. Once let a gas manager get into his head the importance of good repute with the public, and it will not take long for him to see that to have as friends and allies, instead of as opponents, the ironmongers of his town—who some of them may be town councillors, who most of them take an active part in the life of the community, and who all of them are in constant touch with many gas consumers—is to possess a valuable asset, and to have added to the stability of his undertaking.

It is on these grounds of general policy that, as we understand the facts, the Gaslight and Coke Company decided to offer the terms to the principal London ironmongers which have recently been set forth in detail in these columns. The Company frankly tell the trade that the terms are offered as an experiment, designed to see what the trade can or will do for them, and certain to be withdrawn if the response is disappointing. But the latter contingency is, we believe, a remote one, for it is an absolute certainty that every ironmonger worth his salt will strive his utmost to make good the opportunity now afforded him, for which he has clamoured for years; and the trade generally throughout the country is now only waiting for the adoption of this *entente cordiale* by the gas industry as a whole, to throw itself energetically into the work of further advancing the great revival in gas lighting, and of securing the universal adoption in the home of gas for cooking and heating.

There is one thing which the trade have often sought to achieve, but which we think they cannot expect to bring about, and that is the closing of the show-rooms opened by the more progressive of the gas undertakings in the country. These show-rooms have undoubtedly been viewed with much dislike by the trade in the past; but provided the undertaking will do, as the Gaslight and Coke Company have done—viz., make it profitable for the ironmonger to take orders for the hire of stoves and to sell them at the same price as the Company charge, and put their show-rooms at the disposal of any ironmonger who wants to show a customer a better variety of goods than he has room to display—then the ironmongers must be content with an arrangement, not perhaps ideal from their precise point of view, but really reasonable and fair to both parties.

It is not, we hold, reasonable to expect that a gas company who have established an up-to-date show-room or show-rooms should close the doors when the ironmongers open theirs to a display of gas appliances, because it must be granted that no ironmonger can possibly devote more than a certain portion of his space to gas-stoves, &c., and that it is therefore impossible for him to make such a thoroughly comprehensive and varied display of gas apparatus as an up-to-date gas company would naturally make. Moreover, the gas company derive no little benefit from the numerous visits paid by consumers to their show-rooms for purposes other than the inspection of gas-stoves—to pay accounts, to report defects, and so forth—and the educational work that can be done in such a show-room must benefit the gas business generally. The gas industry has had to fight its own battles hitherto, and only the adoption of a fighting policy has saved it in many cases from serious loss; and the trade must not expect that when the industry takes unto itself allies, it will forthwith throw away weapons which it has found of great value in the past. All, indeed, that the trade is, as a body, asking—whatever some of its members may have sought to attain—is that the gas industry should realize their value as allies, and should offer such reasonable terms as can be accepted as a basis for alliance. It is to be hoped that we may have succeeded in convincing some of our gas-manager readers of the advantage to be gained by their undertakings, if they will offer such terms, and bring about an alliance.

INCANDESCENT GAS LIGHTING FOR CHURCHES.

In Defence of the Inverted Burner.

The letter of Mr. L'ce Fletcher, the Managing-Director of the Welsbach Incandescent Gaslight Company, Limited, dealing with the relative merits of the upright and inverted burners for lighting churches, which was reproduced in the "JOURNAL" last week from the "Ironmonger," has brought to us three letters on the subject, the writers of which consider Mr. Fletcher's remarks as calculated to prejudice the use of inverted burners for the purpose indicated.

The Managing-Director of the Star Inverted Incandescent Burner Company, Limited (Mr. Harry Maisner) has sent to us a copy of the following letter addressed by him to the "Ironmonger."

In your issue of the 24th inst., I notice a letter from the Managing-Director of the Welsbach Incandescent Gaslight Company, Limited (Mr. L'ce Fletcher), containing various statements in regard to the lighting of churches, and making a comparison between inverted and upright incandescent burners which I should not trouble to notice had it been made by an ordinary correspondent. But when such statements are made by one in the position of Mr. Fletcher, the public are apt to accept them as correct, if allowed to remain unchallenged.

I fully accept the introduction of your correspondent, that his remarks are written to prevent disappointment to any who should follow the advice of "Gaul"—a correspondent in a previous issue. He then goes on to say he has never seen a single installation of inverted burners in a church that has proved satisfactory. I would simply advise him that if he will take an opportunity of visiting various churches I could mention, including Brent Parish Church, Faversham, I think he will have reason to alter his decision. Possibly the installations he has seen have been put in by the very persons referred to by "Gaul," who have had no experience in fixing inverted burners, but with whose statements Mr. Fletcher does not seem to agree. He adds that no inverted burners should be fitted in places of worship unless the globes have first been wired, owing to the danger of portions of the red-hot inverted glass globe falling upon anyone sitting below. I can only imagine that Mr. Fletcher is confusing the chimneys of upright

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 670.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct. 12	10½	Alliance & Dublin 10 p.c.	20—21	..	5 0 0
245,112	10	,,	7½	Do. 7 p.c.	14—15	..	5 0 0
200,000	5	Nov. 14	7	Bombay, Ltd.	6¼—7	..	5 0 0
40,000	5	,,	7	Do. New, £4 paid	5—5⅛	..	5 1 10
50,000	10	Aug. 30	14	Bourne-mouth Gas and Water: 10 p.c.	28—29	..	4 16 7
51,810	10	,,	7	Bourne-mouth Gas and Water: B 7 p.c.	17—17½	..	4 0 0
53,200	10	,,	6	Bourne-mouth Gas and Water: Pref. 6 p.c.	15—16	..	3 15 0
380,000	Stk.	Aug. 15	12½	Brentford Consolidated	260—265	..	4 14 4
300,000	,,	,,	9⅜	Do. New	198—203	..	4 13 7
50,000	,,	,,	5	Do. 5 p.c. Pref.	120—125	..	4 0 0
206,250	,,	June 14	4	Do. 4 p.c. Deb.	103—106	..	3 15 6
220,000	Stk.	Sept. 27	11¼	Brighton & Hove Orig.	230—235	..	4 15 8
246,320	,,	,,	8½	Do. A. Ord. Stk.	163—168	..	4 18 3
460,000	20	Sept. 27	10	British	41—42	..	4 15 3
104,000	Stk.	Aug. 15	6	Bromley, Ord. 5 p.c.	121—125	..	4 16 0
165,700	,,	,,	4⅜	Do. do. 3½ p.c.	91—94	..	4 15 9
500,000	10	Oct. 12	7	Buenos Ayres (New) Ltd.	11⅛—12	..	5 16 8
250,000	Stk.	June 28	4	Do. 4 p.c. Deb.	96—98	..	4 1 8
150,000	20	July 12	8½	Cagliari, Ltd.	24—26	..	6 6 11
100,000	10	Sept. 27	10	Cape Town & Dis., Ltd.	14—15	..	6 13 4
100,000	10	Oct. 26	4½	Do. 4½ p.c Pref.	9⅜—10	..	4 10 0
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	50—52	..	5 15 5
50,000	Stk.	June 28	4½	Do. 4½ p.c. Deb. Stk.	98—100	..	4 10 0
157,150	Stk.	Aug. 15	5	Chester 5 p.c. Ord.	108½—110½	..	4 10 6
1,443,280	Stk.	Aug. 30	5⅛	Commercial 4 p.c Stk.	110—113	..	4 12 0
560,000	,,	,,	5	Do. 3½ p.c. do.	107—110	−1	4 10 11
475,000	,,	June 14	3	Do. 3 p.c. Deb. Stk.	84—86	..	3 9 9
800,000	Stk.	,,	6⅜	Continental Union, Ltd.	127—130	+1	5 0 0
200,000	,,	,,	7	Do. 7 p.c. Pref.	140—145	..	4 16 7
432,070	Stk.	Aug.	5⅛	Derby Con. Stk.	122—124	..	4 8 9
55,000	,,	July	4	Do. Deb. Stk.	105—107	..	3 14 9
486,090	10	July 27	11	European, Ltd.	24⅜—25⅛	..	4 6 3
354,060	10	,,	11	Do. £7 10s. paid	18—19	..	4 6 10
15,203,110	Stk.	Aug. 15	4⅛	Gaslight and Coke: 4 p.c. Ord.	98—99	−½	4 8 11
2,600,000	,,	,,	3⅛	Gaslight and Coke: 3⅛ p.c. max.	88—90	..	3 17 9
3,799,735	,,	,,	4	Gaslight and Coke: 4 p.c. Con. Pref.	107—110	+1	3 12 9
4,193,975	,,	June 14	3	Gaslight and Coke: 3 p.c. Con. Deb.	85—87	+1	3 9 0
258,740	Stk.	Sept. 13	5	Hastings & St. L. 3½ p.c.	98—103	..	4 17 1
82,500	,,	,,	6⅔	Do. do. 5 p.c.	118—121	..	5 7 5
70,000	10	Oct. 12	11	Hongkong & China, Ltd.	19¼—20⅜	..	5 7 4
4,940,000	Stk.	Nov. 14	8	Imperial Continental	180—183	−½	4 7 5
473,600	Stk.	Aug. 15	3½	Do. 3½ p.c. Deb. Red.	95—97	..	3 12 2
183,242	Stk.	Aug. 30	6	Lea Bridge Ord. 5 p.c.	120—125	..	4 16 0
306,083	,,	June 28	4	L'rpool Unit'd Deb. Stk.	110—112	..	3 11 5
£			p.c.				£ s. d.
561,000	Stk.	Aug. 30	10	Liverpool United A	229—231	..	4 6 7
718,100	,,	,,	7	Do. B	169—170	..	4 2 4
144,140	Stk.	Sept. 13	7⅞	Maidstone 5 p.c.	145—150	..	5 1 8
75,000	5	Nov. 29	5	Malta & Medn., Ltd.	4¼—4⅜*	+¼	5 5 3
560,000	100	Oct. 1	5	Met. of 5 p.c. Deb.	101—103	..	4 17 1
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	100—102	..	4 8 3
541,920	20	Nov. 14	3¼	Monte Video, Ltd.	11⅛—12⅛	+⅛	5 12 0
1,675,892	Stk.	Aug. 15	4⅜	Newc'tle & G'tesh'd Con.	111⅛—112⅛	..	4 2 3
406,625	Stk.	June 29	3½	Do. 3½ p.c. Deb.	98—100	..	3 10 0
15,000	10	Aug. 30	10	North Middlesex 10 p.c.	20—21	..	4 15 3
55,940	10	,,	7	Do. 7 p.c.	13⅜—14⅜	..	4 16 7
300,000	Stk.	Nov. 29	8	Oriental, Ltd.	150—155*	+2½	5 3 3
60,000	5	Sept. 13	7	Ottoman, Ltd.	5⅞—6⅛	..	5 12 0
398,490	5	Oct. 26	7	Primitiva Ord.	7⅛—7⅜	−⅛	4 10 4
796,980	5	July 27	5	Do. 5 p.c. Pref.	5⅜—5⅝	..	4 13 0
488,900	100	Dec. 1	4	Do. 4 p.c. Deb.	94—96*	..	4 3 4
851,070	10	Oct. 12	7	River Plate Ord.	12⅛—12⅜	..	5 7 8
300,000	Stk.	June 28	4	Do. 4 p.c. Deb.	97—99	..	4 0 10
250,000	10	Sept. 27	8	San Paulo, Ltd.	13⅜—14	..	5 14 4
70,000	50	July 2	5	Do. 5 p.c. Deb.	49—51	..	4 18 0
135,000	Stk.	Sept. 13	10	Sheffield A	244—246	..	4 1 4
209,984	,,	,,	10	Do. B	244—246	..	4 1 4
523,500	,,	,,	10	Do. C	244—246	..	4 1 4
70,000	10	Oct. 26	10	South African	15½—16½	..	6 1 3
6,350,000	Stk.	Aug. 15	5⅛	South Met., 4 p.c. Ord.	128—130	..	4 4 7
1,895,445	,,	July 12	3	Do. 3 p.c. Deb.	84—86	..	3 9 9
201,720	Stk.	Sept. 13	8	South Shields Con. Stk.	156—158	..	5 1 3
575,000	Stk.	Aug. 15	5⅛	S'th Suburb'n Ord. 5 p.c.	123—126	..	4 7 4
60,000	,,	,,	5	Do. 5 p.c. Pref.	123—126	..	3 19 4
112,533	,,	July 12	5	Do. 5 p.c. Deb. Stk.	128—133	..	3 15 2
502,310	Stk.	Nov. 14	5	Southampton Ord.	105—110	..	4 10 11
120,000	Stk.	Aug. 30	6⅔	Tottenham and Edmonton: A 5 p.c.	127—130	..	5 0 0
388,020	,,	,,	5	Tottenham and Edmonton: B 3½ p.c.	104—106	..	4 14 4
137,500	,,	June 28	4	Tottenham and Edmonton: 4 p.c. Deb.	103—105	..	3 16 2
182,380	10	June 14	8	Tuscan, Ltd.	10⅛—11	..	7 5 6
149,900	10	July 2	5	Do. 5 p.c. Deb. Red.	104—106	..	4 14 4
193,742	Stk.	Sept. 13	5	Tynemouth 5 p.c. max.	106—108	..	4 12 7
30,000	Stk.	Aug. 15	8	Wandsworth and Putney: A 5 p.c.	—	..	—
855,636	,,	,,	5⅝	Wandsworth and Putney: B 3½ p.c.	140—145	..	4 9 8
75,000	,,	,,	5⅝	Wandsworth and Putney: C 3½ p.c.	113—115	..	4 17 6
79,416	,,	June 28	3	Wandsworth and Putney: 3 p.c. Deb. Stk.	82—85	..	3 10 5
779,875	,,	Aug. 15	5⅛	West Ham 5 p.c. Ord.	104—106	..	4 16 6
185,000	,,	,,	5	Do. 5 p.c. Pref.	120—123	..	4 1 4
193,300	,,	June 28	4	Do. 4 p.c. Deb. Stk.	103—106	..	3 15 6

Prices marked * are "Ex div."

burners with the globes of inverted burners; for did anyone ever see a red-hot globe attached to an inverted burner? And how seldom does an inverted globe break in comparison with the chimney or globe of an upright burner.

In conclusion, Mr. Fletcher states that he has never seen a burner of the inverted type consuming less than 3 cubic feet of gas per hour, and giving a result equal to a No. 2 Kern burner, which consumes only 2¼ cubic feet per hour, and gives a 50-candle power result. I can only point out to Mr. Fletcher, and to those whom he desires by his statements to prevent being disappointed, that the patent "Star" inverted burner only consumes, under ordinary circumstances, 2½ cubic feet per hour, and gives about 70-candle power light; and under exceptional treatment the burner only consumes 2¼ cubic feet per hour without the candle power being reduced.

I am glad to read that Mr. Fletcher does not condemn the inverted system, but considers many dealers are selling inverted burners that are positively a danger to human life. On this point I am pleased to agree with him. But his previous remarks were applied generally to inverted burners without exception; and therefore I consider his letter calls for correction.

We have also received a letter from Messrs. Bland and Co., in the course of which they make the following remarks.

Mr. Fletcher, in his letter, is somewhat contradictory, if we may say so, inasmuch as he adversely criticizes the inverted system of gas lighting in churches in the major portion of his epistle in favour of the upright Kern, in which he is personally interested; but he concludes by saying that he is not condemning the inverted system—far from it. He considers there is a future for it; but many dealers are selling inverted burners which are absolutely unfit for use, and, in his judgment, constitute a danger to human life. Are we to infer that it is only the inferior make of inverted burners that he does not consider satisfactory, or the whole system? If the former, we are heartily in agreement; but should the latter be the correct interpretation, our own experience justifies a strong protest. The "Bland" burners have been installed in a large number of churches all over the country for many months past, and we have abundant testimony to prove that the results have been most satisfactory in every way. The globes which we recommend are toughened by a patent process, and no greater risk of breakage is incurred than in the ordinary upright incandescent burner. With regard to the church lighting authorities who insist on turning down the lights during the sermon, we have overcome this difficulty by fixing the pneumatic distance gas lighter to part of the service. As a comparison to the Welsbach No. 3 Kern upright burner, for which an illuminating power of 75 candles or "thereabouts" is claimed, may we humbly mention the "Bland," which gives a light of 80-candle power with a similar consumption of gas of under 3 cubic feet per hour? May we further point out that, whereas a large proportion of the light from the former is lost on the roof, in the latter the congregation receive the full benefit? The cost of maintenance will also compare very favourably, we have no hesitation in saying.

Another letter addressed to the "Ironmonger" was by a correspondent signing himself "Gyp." The following are some extracts from his letter.

I consider that no tradesman should fix any incandescent burners for a private customer without at the same time carefully showing him all the points about cleaning and putting on new mantles; and that for large buildings, places of worship, shops, &c., the tradesman, when installing incandescent lights of any kind, should either undertake the maintenance himself or see that some competent and reliable person is given that duty. I have sold grosses of incandescent burners of the ordinary kind, and have never had any complaints; but I am very chary about recommending the inverted burner. I think these burners are both bought by customers and recommended by dealers more on account of their novelty than for any other reason. Certainly they are often fixed where they are most unsuitable; and to attempt to make an antiquated five-light chandelier or a broken-down shilling gas-bracket in a shop window look like electric light by putting on a third-rate inverted burner, shows the man who does it to be unworthy of the name of ironmonger, plumber, or gas-fitter. From the number of ordinary and inverted burners I see fixed in shops and shop windows, on tumble-down gas-brackets at the sides, on old two-light pendants and chandeliers, and other most unsuitable fittings, I think (and I am confirmed in this opinion by well-known gasmen) that the majority of ironmongers, plumbers, and gas-fitters have no more idea of "effective lighting" than a tinker; and I am inclined to maintain that if 95 per cent. of the makers of ordinary and inverted burners, together with the same proportion of so-called ironmongers, gas-fitters, and plumbers, could be swept out of existence, the gas-lighting industry would prosper as it never did before.

The Managing-Director of the Wholesale Fittings Company (Mr. J. Altman) says the third paragraph of Mr. Fletcher's letter is totally contrary to their own experience; and, in order to be able to speak with up-to-date authority on the subject, they sent a representative to one of the churches fitted with their inverted "Yotto" burner, and received from him the information, first, that in the twelve months the installation had been in operation no mantle had been broken during the conduct of Divine Service; second, that no mantle had been fractured or had fallen among the congregation; thirdly, that the gas was invariably turned down during the address to the congregation at every evening service, and that the official responsible for lowering the lights said that he could turn them nearly out from the meter without any bad effect, no bye-pass being needed; while with regard to carbonizing the mantle or the formation of soot, the burners were cleaned once every three months. Mr. Altman adds that in this installation, which is in the church of All Hallows, East India Dock Road, the 63 previous lights were replaced by 21 inverted incandescent burners, and a more brilliant light was obtained than there had ever been before; while the whole cost of refitting the church was saved out of the first six months' gas bill from October to March.

"VOLCANIC" (Powder).——————"VOLCUM" (Paste).

Andrew Stephenson,

Tel. Address:
"VOLCANISM, LONDON."

182, Palmerston House,
Old Broad Street,
LONDON, E.C.

LEST YE FORGET.

ELECTRIC STREET LIGHTING AT TUNBRIDGE WELLS.

Excessive Expenditure.

Under the title of "Municipal Economy in Public Lighting," the following article appears in the "Kent and Sussex Courier" dealing with the cost of street lighting at Tunbridge Wells. The figures quoted should—if anything will—galvanize the ratepayers into something approaching activity.

Those who have watched the returns published by public authorities in London and elsewhere, showing the saving to the rates effected by reverting to gas lighting in its present improved form, instead of electricity, for street lighting, will be interested to know how this question affects Tunbridge Wells. There is now a proposal to restore to the Watch Committee of the borough the control of the public lighting, which was transferred from that Committee to a Special Lighting Committee eleven years ago. The latter Committee has also the administration of the municipal electricity undertaking, and has, therefore, discharged the difficult task of acting as both buyer and seller. In the last year that the Watch Committee controlled the public lighting of the town—1895—it cost £2710; and after eleven years' administration by the Lighting Committee, the cost to the rates for public lighting, according to the Corporation accounts, was £4653, or an increase of £1943. This does not represent the total increase, because gas in 1895 was 3s. 3d. per 1000 feet; and it has for some time past been reduced to 2s. 10d.; so that the cost of public gas lighting per lamp has been decreasing. At present the Gas Company charge a fixed sum for the improved incandescent gas lighting in street-lamps, of £3 11s. 6d. per lamp, as against £3 19s. per lamp for the electrical glow lamps (not arcs) by the Lighting Committee. It will be said that in ten years the area to be lighted has increased; but taking the increase in the cost at £2020 (and it undoubtedly exceeds this amount), and estimating the cost of gas lighting in its improved form at £90 per mile, with lamps placed at existing distances—gas-lamps being further apart than electric glow-lamps—it will be seen that, to account for an increase of £2000 in the cheaper form of public lighting, there would have to have been added to the area of the borough in the last ten years over 22 miles of new streets, which has not been the case. The explanation, of course, is in the excessive cost of electric over gas lighting, of which an instance is seen in Mount Ephraim, where ten arc lamps cost £210 per annum, whereas improved gas-lamps could be substituted for £70 per annum.

This excessive expenditure appears to benefit neither the public nor the electricity undertaking. There is no advantage to the revenue of the latter, as the public electric lighting is understood to be done at cost price, so that the electricity undertaking would not suffer by the loss of the whole or part of the street lighting. The resultant decrease in the evening load at the works might obviate the necessity of a further capital expenditure on the extension of the plant, which the Committee state must be carried out before next winter at the present rate of increase in the public consumption of electric energy. On this point, however, we cannot offer any opinion, as no details of the intended extension are yet before the Council. On the other hand, from the public point of view, a reversion to gas would mean better lighted streets (as there is no question of the superiority of the latest forms of gas-burners over electric glow lamps, as distinguished from the more expensive arc lamps), and an annual saving in the cost to the rates which may be approximately estimated at a ¾d. rate. Taking the official estimate of the cost of the Chalybeate Spring scheme, and of the High Street Bridge widening, as jointly representing an annual rate of 1½d., it will be seen that half of the estimated charge to the rates of these two schemes could be met by re-arranging the public lighting of the town, and at the same time it would remedy the complaints of inefficient lighting at Mount Pleasant and elsewhere. When the Watch Committee once more control the public lighting, as in other towns, it is evident that some important possibilities of municipal economy await their consideration. Any opposition to schemes of public improvement is not, we believe, directed against improvements as such, but against increase of the rates; and a reduction of the latter will probably be considered one of the most advantageous works that the Council could take in hand.

We append a return of the annual cost of public lighting from the year before the introduction of the electric light down to the present time, as shown in the borough accounts.

Cost of Public Lighting.

	Gas.	Electric Light.	Total.
1895	£2710	—	£2710
1896	2510	£251	2762
1897	2336	887	3224
1898	3005	879	3884
1899	2224	1231	3456
1900	2137	1368	3505
1901	2271	1518	3789
1902	2481	1885	4367
1903	2153	2132	4586
1904	2131	2537	4668
1905	2126	2550	4677
1906	2098	2555	4653

In the neighbouring town of Bexhill, still more startling results may be quoted. In 1899 (the last year the town was publicly lighted by gas), the street lighting cost approximately £800. This year the cost of the substituted electric lighting is £3100. It is impossible that the street lighting has increased 400 per cent. in seven years; and it is estimated that gas instead of electricity in the streets of Bexhill would mean a saving of £2000, or 5d. in the rates. As a contrast to this, we may quote the report of the Streets Committee of the Corporation of the City of London, who have reverted to gas, which shows that in Queen Victoria Street, Fleet Street, and Monument Street the saving in the annual lighting bill is £490, which, if multiplied by other

LONDON

SUPPLIED

RICHMOND'S

Views are of:—

Prince of Wales Theatre.
Christ Church, Westminster.
Watson & Co., Waterloo Place.
Swan & Edgar, Piccadilly.
Hackney Empire.
York Hotel, Albemarle Street.
Covent Garden Theatre.

Advertisement of the Richmond Gas Stove & Meter Co., Ltd. London Offices & Show-

thoroughfares which are electrically lighted, would, of course, represent a remarkable economy. In Bristol, also, an instance has just been furnished of less light and increased cost. There has been spent on street electric lighting £11,891; whereas the Gas Company have offered to light the same area with improved gas-lamps, having 100-candle power burners, for £2830, or a saving to the rates of £9000 per annum. We shall not, in face of these figures, be accused of over-estimating the possible saving in Tunbridge Wells.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Edinburgh and Leith Gas Commissioners held on Monday last their first meeting after having been reconstituted. The new Lord Provost of Edinburgh—Mr. J. P. Gibson—was unable to be present, and the chair was taken by Provost Mackie, of Leith. The Clerk reported that he had made application to the Corporations of Edinburgh and Leith, and to the County Council of Midlothian, to be furnished with copies of reports received from their sanitary advisers as to smells said to emanate from the Granton Gas-Works, and that the Edinburgh Corporation had sent in prints of reports received by them, in May and July last, from their Medical Officer of Health and Sanitary Inspector; whereas the Corporation of Leith had replied that they had received no such reports, and the County Council that the reports they had received were private, and could not be communicated to the Commissioners. The Works Committee stated that the Engineer had brought under their notice that he had recently been experiencing very considerable difficulty in getting coal contractors to implement their bargains; and the Committee, having considered the terms of the contracts, instructed the Engineer to buy against the contractors, if he thought fit. The Commissioners reappointed Judge Bryson the Convener of the Works Committee, and Mr. R. Menzies Convener of the Finance and Law Committee, and reaffirmed the resolution that all the members of the Commission should be members of both Committees.

Among the remits renewed was one to the Works Committee, originally made on April 10, 1905, to consider whether, having regard to the large and increasing use of gas for heating, cooking, and with the incandescent mantle for lighting, the time had now come for obtaining power to reduce the candle power of the gas. Upon this subject, Mr. Stewart wanted to know if it were necessary to supply 20-candle power gas to the consumer or at the works. The Town Clerk of Edinburgh had held that it was to the consumer. The Clerk to the Commissioners replied to Mr. Stewart that he thought the Town Clerk was not right. The quality of the gas was to be judged at the official testing-place, which was the Granton Gas-Works. It was within the power of the Commissioners to have a testing-place apart from Granton. It was not within the power of either of the two Corporations to have a testing-place of their own. He then read from the Gas-Works Clauses Act of 1871, and from the Commissioners' Act of 1888, the provisions relating to the testing of gas. Mr. Chisholm asked if the Gas-Works Clauses Act overrode the Commissioners' Act. He had had, he said, a good deal to do with that matter. They could name practically any place they liked. The Clerk replied that he was not aware of any overriding whatever; and he pointed out that the Gas Acts only made provision for testing by local authorities—not by private parties. The Chairman asked if there were much loss of illuminating power; to which Mr. Herring replied that the loss between the Granton Gas-Works and the Tanfield testing-station, which was not an official testing-station, but one which they had erected to test that particular fact, was from $1\frac{1}{2}$ to $1\frac{3}{4}$ candles, with gas of the quality which was being supplied at present. Formerly, with gas of over 24 candles, there was a loss of $2\frac{1}{2}$ candles. He was very anxious to ascertain, when they got into some colder weather, what the loss might then be. Two letters from the Town Clerk of Edinburgh were read. In the first, dated Nov. 5, the Town Clerk said that at the previous meeting of the Town Council reports were submitted by the City Analyst (Mr. J. Falconer King), from which it appeared that the illuminating power of the gas at Granton on Oct. 8 was 18·36 candles, and that at Canonmills, on Oct. 11, it was 18·61 candles; and that he was instructed to draw their attention to the fact that, under the Gas Act of 1888, the illuminating power of the gas supplied by the Commissioners was to be not less than 20 candles, and to ask for an explanation why the gas on the dates mentioned was supplied at less than the statutory illuminating power. The second letter was received on Nov. 22, and stated that at a meeting of the Town Council on the 20th, the Town Clerk was again instructed to communicate with the Commissioners on the matter. The report of the Analyst established that on Nov. 1 the illuminating power of the gas at Canonmills was 18·05 candles; that at Granton on Nov. 6 it was 20·19 candles; and that at Canonmills on Nov. 13 it was 17·77 candles; and that he was instructed to ask for a definite reply to his previous letter at their earliest convenience. The Clerk explained that he acknowledged receipt of both letters, and that this was the first meeting of the Commission since they were received. The proposal was made that the letters should be sent to the Works Committee; but Mr. Herring, being ready to reply to the statements made, was allowed to read his reply, which was to the effect that "the low illuminating power on Oct. 8 at Granton, stated at 18·36 candles, was brought about owing to the starting of some of the plant in connection with the new section of the works. To show how temporary this was, he might say that on the day previous it was over 20 candles, and on the day following over 20 candles; and, further, that the drop recorded by Mr. King was of a most temporary character, as their own test, on the same evening, showed 20·04 candles. With regard to the illuminating power tests at the Canonmills testing-station, it would be remembered that the Commissioners some time ago, at the request of the Corporation, allowed the use of the in-town testing-stations, which were purely experimental stations, and were not statutory stations within the meaning of the

BUILDINGS

WITH

RADIATORS

Views are of:—

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Dickens & Jones, Regent Street.
Manchester Hotel.
Horse Guards, S.W.
Shaftesbury Theatre.
Stagg & Mantle, Leicester Square.

Rooms: 132, Queen Victoria St., E.C. General Offices & Works: Warrington,&c.

Commissioners' Act. Furthermore, after the gas left the works, it was impossible for the Commissioners to assume any control over it during the process of distribution, apart from the simple one of regulating pressure." Mr. Chisholm asked if intimation were given of the visits of the Analyst. Mr. Herring replied that there was not; he came whenever he liked. Bailie M'Nab moved that a copy of Mr. Herring's statement be sent to the Town Clerk, and that the matter be remitted to the Works Committee, to consider whether they should not have other testing-stations than at Granton. Judge Bryson seconded Bailie M'Nab's motion, which was unanimously adopted; and this brought to a close a much longer sitting than usual.

Another, and a more alarming, occurrence than that mentioned last week took place in Dundee on the afternoon of Monday last. About four o'clock the Fire Brigade were summoned to the premises in High Street occupied by Mr. D. M. Brown, who carries on an extensive general drapery business, with a luncheon room attached. The fire was checked at the start, and was, in fact, extinguished by the shop staff before the arrival of the Brigade. There had been a strong smell of gas, and, as a matter of fact, it was gas bursting into flame, at more than one part of the building, which constituted the fire. Inquiry revealed that in the course of repairing an electric cable at the foot of Reform Street, a short-circuit had been created, which fused a service-pipe of 1½-inch diameter, in front of Mr. Brown's establishment, and the electric current, getting on to the pipe, pervaded the whole building, igniting the gas wherever it met with sufficient obstruction to raise the temperature to the point of ignition. Mr. High, a member of the Town Council, has given it as his opinion that all the trouble which has been experienced in Dundee, in the shape of street explosions, has been the effect of defective electric cabling, and was not due to anything being wrong with the gas-piping. Mr. Brown's premises were lighted by candles for the remainder of the evening, and other shops in the neighbourhood were without light for nearly an hour.

Extensions which have been made to the works of the Lochgelly Gas Company, Limited, were formally opened on the afternoon of Wednesday of this week. The principal work has been the erection of a new gasholder, of a capacity of 100,000 cubic feet, at a cost of fully £3000. The plans and specifications for the work were prepared by Mr. J. D. Keillor, the Manager, and the Contractors were Messrs. R. Dempster and Sons, Limited, of Elland.

At a meeting of the Royal Scottish Society of Arts on Monday, Mr. John Rosie, of Edinburgh, exhibited and described an apparatus which he has invented for automatically lighting and extinguishing public lamps. It works by means of increased pressure.

The Corporation Gas-Works at Troon were considerably damaged by a gale last night. The wind was blowing from the south-west, with hurricane force. A gust more fierce than usual lifted the roof off the purifier-house and landed it on the top of the retort-house. The shed is 60 feet long, with walls of brick, which have sustained little damage; but some was caused to the retort-house. It is fortunate that no one was injured.

CURRENT SALES OF GAS PRODUCTS.

Week ending Dec. 1.

In the London market, pitch is perhaps slightly easier; but at the lower prices very large business has been done, with the result that makers are much more independent, Ordinary London creosote is in very strong demand; and not less than 2½d. naked at sellers' works is now asked for it. 90 per cent. benzol is quoted from 1s. 0½d. to 1s. 1d. Crude carbolic and crystal carbolic are without change. Sulphate of ammonia is slightly lower in value; but makers have very largely disposed of their production.

LIVERPOOL, *Dec.* 1.

Sulphate of Ammonia.

There has again been a very quiet market. November contracts being covered, and buyers being inclined rather to wait in regard to December requirements, there has been difficulty in placing current output, and prices have declined further at all points. The closing quotations are consequently £12 per ton f.o.b. Hull, £12 2s. 6d. per ton f.o.b. Liverpool, and £12 5s. per ton f.o.b. Leith, with buyers holding off. Similarly, the forward position has been neglected, and no important first-hand business has transpired. There has, however, again been a certain amount of speculative selling abroad; but owing to the indifference of buyers, this is not supposed to have bulked large.

Nitrate of Soda.

This article is still extremely quiet in all positions; the heavy November shipments having rather unnerved sellers as well as buyers. Spot prices are 11s. 3d. and 12s. per cwt. for 95 per cent. and refined qualities respectively.

LONDON, *Dec.* 1.

Tar Products.

Markets for tar products have been steady during the past week, with the exception of pitch, which is still weak for this year's delivery. It is reported that business has been done in London for delivery all over next year at under 28s.; while for immediate shipment, 27s. would probably be accepted for small parcels. On the east coast, sales have been made at 26s. for prompt shipment; while for forward, makers would accept from 26s. 6d. to 27s. 6d., according to position. On the west coast, the market may be taken as 26s. to 26s. 6d. Manchester, and 27s. to 27s. 6d. Liverpool; but business could be done at outside ports at under these figures. Creosote is still very firm. Small second-hand parcels of London oil are offering from time to time at prices under those asked by makers. The latter are very well sold, and refuse to consider any business except at good figures. In the Midlands and the North, manufacturers are also well sold, and ask high prices for whatever quantities they may have available. The market for carbolic

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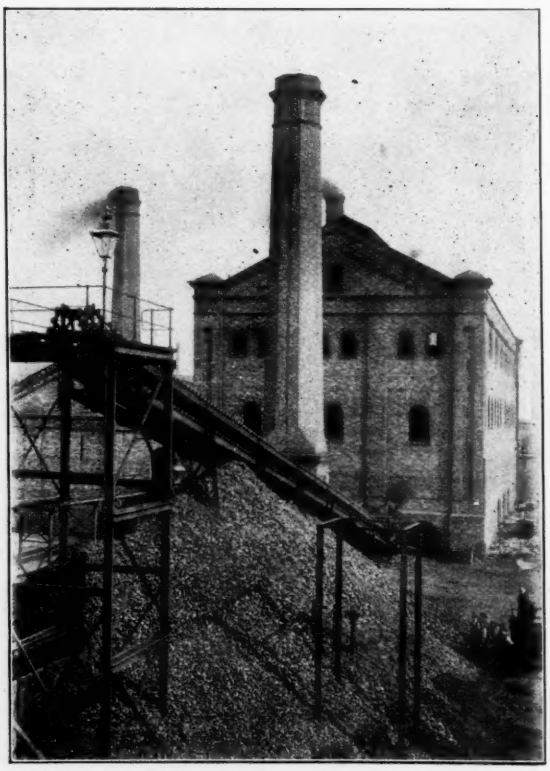

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acid is rather quiet. Continental consumers now refuse to pay more than 1s. 8¾d. on the east coast, at which price business has been done for this year's delivery. In crystals, no sales of importance are reported. Benzol, 90 per cent., is very firm, though Continental consumers report having purchased English quality at low prices upon the east coast for January-June delivery; but in London this article is very scarce, and high prices are reported to have been paid. In 50-90 per cent., the market remains about the same; and there has been practically no reduction in prices. There is a very good demand for solvent naphtha, especially in London, where manufacturers have little for disposal. On the east coast, 1s. 3d. per gallon is still being asked for next year's delivery. There is no change in the market for toluol. A small parcel is reported to have been sold at 1s. 2d. in London; but business has been done at under this upon the east coast. There is nothing doing in anthracene.

The average values during the week were: Tar, 16s. to 20s. Pitch, London, 27s. to 27s. 6d.; east coast, 26s. to 26s. 6d.; west coast, 26s. to 26s. 6d. Benzol, 90 per cent., 11¾d. to 1s. 0½d.; 50-90 per cent., 11½d. to 1s. Toluol, 1s. 1½d. to 1s. 2d. Crude naphtha, 4¾d. to 5¼d.; solvent naphtha, 1s. 3d. to 1s. 4½d.; heavy naphtha, 1s. 3d. to 1s. 5d. Creosote, London, 2½d. to 2⅝d.; North, 1⅝d. to 2d. Heavy oils, 2⅜d. Carbolic acid, 60 per cent., 1s. 8¾d. to 1s. 9¼d. Naphthalene, £4 10s. to £8 10s.; salts, 31s. 6d. to 35s. Anthracene, "A" quality, 1½d. to 1⅝d.

Sulphate of Ammonia.

The market for this article has been very quiet during the past week, and lower prices are reported in all directions. The London Companies still maintain their previous quotations; but a London parcel was offered for sale at equal to £12 upon Beckton terms, without business resulting. In Hull, a very fine make was sold at £12 3s. 9d. for the latter part of December; but for ordinary qualities, £12 to £12 1s. 3d. would have to be accepted. There is no business doing in Leith; and the price is nominally £12 5s. But manufacturers are well sold, and there is practically nothing offering, though in Glasgow £12 3s. 9d. is reported to have been accepted. In Liverpool, business is stated to have been done at £12 2s. 6d. for prompt.

More New Issues of Gas and Water Capital.—Last Tuesday, Mr. Alfred Richards sold, at the Mart, Tokenhouse Yard, E.C., by order of Directors, some new issues of gas and water capital. The first lots consisted of 5 per cent. ordinary stock of the South Essex Water Company, carrying 4¼ per cent. dividend as from the 17th inst.; and they all fetched from £106 to £107 per £100. A few £10 "C" shares (7 per cent.) in the Harrow and Stanmore Gas Company were sold at from £13 to £14 each; and some 4 per cent. perpetual debenture stock at par. A parcel of £10 preference shares in the Barking Gas Company, carrying 6 per cent. dividend from the 1st prox., fetched from £12 7s. 6d. to £12 15s. per share.

COAL TRADE REPORTS.

Lancashire Coal Trade.

Coal continues in strong demand in all sections. The boom in the cotton trade shows no sign of exhaustion; and a number of new mills in Oldham and the district are being pushed forward. These increases make further demands on colliery proprietors for engine fuel, which is becoming more scarce than ever before known. A further rise in price seems likely to ensue. Gas coal and cannel are also being a good deal sought after; and some apprehension is felt that next year's contracts will exceed those of the current year. The average quotations on the Manchester Coal Exchange at present are as follows: Best house coal 13s. 6d. to 14s. 6d. per ton at the pit, secondary 12s. 6d. to 13s. 6d., common 9s. to 10s., burgy 7s. 6d. to 8s. 6d., best slack 6s. 9d. to 7s. 6d., medium 6s. 6d. to 7s. common 5s. 9d. to 6s. 6d., and shipping coal 9s. 6d. to 10s. 6d. Shipping coal is in good request, both for bunkers and export. Furnace coke is selling well. The monthly meeting of the Lancashire and Cheshire Miners' Federation at Wigan on Saturday rejected the proposals of the Coal Conciliation Board for a renewal of its existence; and the Durham miners have abolished their own Conciliation Board.

Northern Coal Trade.

There is a decidedly firmer tone in the coal trade, with a fuller demand; and in some cases higher prices are asked than those that have been recently ruling. Northumbrian collieries are now making full work, and that at a season which is sometimes a dull one for these pits. In steam coals, best Northumbrians are now from 11s. 7d. to 11s. 10½d. per ton f.o.b., second-class steams 10s. to 10s. 6d., and steam smalls are steady and rather scarce at from 7s. to 8s. In the gas coal trade, the deliveries on contract are at the highest point; and they take up the largest share of the output—more especially of the best descriptions of gas coals, though for all kinds there is now a very strong request. Production is full at the collieries at present; but as it will be more broken later in the month, there is a disposition to get as heavy shipments away now as possible. Prices of gas coals are very firm, and for Durham kinds they vary from about 10s. to 11s. 3d. per ton f.o.b., with higher values for one or two special sorts. No contracts of moment are reported this week. Coke is dearer; and this helps gas coke in the face of a larger production. Good gas coke is quoted at from 13s. to 14s. per ton f.o.b.

Scotch Coal Trade.

Trade continues firm; outputs being easily disposed of. The foreign demand is heavier than it has ever been known to be. Prices for some sorts, including splint, have been formally advanced, and may be quoted at: Ell 9s. 9d. to 11s. 3d., splint 11s. 9d. to 12s. 3d., and steam 9s. 9d. to 10s. The shipments for the week amounted to

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	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily.
Blackburn	1,250,000	Winnipeg, Man.	500,000	Malton	150,000
Windsor St. Works, Birmingham	2,000,000	Colchester (Second Contract).	300,000	Smethwick	500,000
Saltley Works, Birmingham	2,000,000	York	750,000	Gravesend	300,000
Colchester	300,000	Rochester	500,000	Pernambuco, Brazil	125,000
Birkenhead	2,250,000	Kingston, Ont.	300,000	Duluth, (Second Contract)	300,000
Devizes	120,000	Crystal Palace District	2,000,000	Leicester (Second Contract)	1,000,000
Saltley, Birmingham (Second Contract)	2,000,000	Duluth, Minn.	300,000	Newport (Second Contract)	250,000
Windsor St., Birmingham (Second Contract)	2,000,000	Caterham	150,000	Brockville	250,000
Halifax	1,000,000	Leicester	2,000,000	Toronto (Third Contract)	750,000
Toronto	250,000	Enschede, Holland	150,000	Montreal, Ont. (Second Con.)	1,800,000
Ottawa	250,000	Buenos Ayres (River Plate Co.)	700,000	Toronto (Fourth Contract)	1,000,000
Lindsay (Remodelled)	125,000	Burnley	1,500,000	Hamilton, Ont.	400,000
Montreal	500,000	Kingston-on-Thames.	1,750,000	Rochester (Third Contract)	1,600,000
Toronto (2nd Cont., Remodelled)	2,000,000	Accrington	500,000	Leeds (Second Contract)	900,000
Belleville	250,000	Tonbridge	300,000	Buenos Ayres (Primitiva Co.)	1,200,000
Ottawa (Second Contract)	250,000	Stretford	500,000	Buenos Ayres (New Co.)	1,200,000
Brantford (Remodelled)	200,000	Oldbury	300,000	Christchurch, N.Z.	300,000
St. Catherines (Remodelled)	250,000	Todmorden	500,000	Rochdale	1,600,000
Kingston, Pa.	125,000	Saltley, Birmingham (Third Contract)	2,000,000	St. John's, Newfoundland	250,000
Peterborough, Ont.	250,000	York (Second Contract)	750,000	Brantford (Second Contract)	400,000
Wilkesbarre, Pa.	750,000	Rochester (Second Contract)	500,000	Smethwick (Second Contract)	500,000
St. Catherines (Second Cont.)	250,000	Newport (Mon.)	250,000	Pontypridd	250,000
Buffalo, N.Y.	2,000,000	Tokio, Japan	1,000,000	Montreal (Third Contract)	1,800,000
		Newcastle-on-Tyne	1,800,000	Guelph, Ont.	350,000
		Leeds	1,800,000	Buenos Ayres (River Plate Co.) Second Contract	750,000
				Belgrano (River Plate Co.)	500,000
				Quebec	250,000

And, in addition, COAL GAS PLANTS at NELSON, B.C., CHATHAM, BERLIN, NAPANEE, OWEN SOUND, CALGARY, and WINNIPEG.

262,899 tons—a decrease of 28,604 tons upon the preceding week, but an increase of 17,818 tons upon the same week of last year. For the year to date, the total shipments have been 12,568,709 tons—an increase of 1,448,208 tons upon the corresponding period of 1905.

Extraordinary Demand for Durham Coke.

Not for about thirty years (says the "Financial Times") has there been such an extraordinary demand for Durham coke as exists at present, though prices are considerably lower than during the iron trade boom six or seven years ago. The activity became very marked about a fortnight ago, owing to exceptionally heavy requirements from abroad—chiefly from America and Germany—for all classes of pig-iron, Cleveland, hematite, and spiegel. The result has been to cause a great scarcity in Durham coke, and to send prices up. There are now no stocks of coke on the benches at the coke-making collieries, iron-masters have great difficulty in obtaining sufficient coke to keep their furnaces going, and on both the east and west coasts there is a great fear of a failure in the Durham coke supply. During the past twelve months, the rates for best quality coke have advanced between 3s. 9d. and 4s. a ton, and good medium quality from 3s. to 3s. 6d. (of which 1s. to 1s. 6d. has been added within the last fortnight); present quotations at Middlesbrough being 20s. 6d. to 21s. for best, and medium a little lower. Odd parcels for delivery before Christmas have been sold at 22s., and large contracts have just been renewed for lengthy periods at increases of 4s. 3d. and 4s. 4½d. a ton on the price paid last year by the same firms.

Gas-Testing in London under Recent Legislation.

At the meeting of the London County Council to-day, the Public Control Committee will submit a report on the remuneration of the staff in the Chemical and Gas Department. The Committee point out that the London Gas Act, 1905, casts upon the Council the obligation to carry out certain additional testings of gas, except on Sundays. Extra duties have consequently devolved upon the Gas Examiners, who now have to give a considerably increased amount of time to the performance of their duties. The Committee therefore think their scale of pay—which is £120, rising by yearly increments of £5 to £150, and of relieving gas examiners 10s. a day when at work—should be revised. They propose that the scale should begin at £135 and rise to £165; and that relieving examiners should have 12s. a day when at work, except on Sundays, when they should have 10s.—the increase in the pay of the regular examiners to date from the 16th ult. The Committee say there is sufficient provision in the estimates for the current financial year to cover the additional expenditure, which will amount to about £100; and the scheme they propose will involve an approximate additional outlay of £300 during the next financial year, in which all the present Gas Examiners, with one exception, will reach the proposed maximum salary.

Incandescent Gas Lighting at Chesterton.—The town of Chesterton, in Staffordshire, was lighted last Wednesday evening by incandescent gas. There had previously been no street-lamps in the history of the town; and the change from darkness to so brilliant and up-to-date an illumination was greatly appreciated. The work was carried out by the Wolstanton United Urban District Council, who, as our readers may remember, have recently obtained parliamentary powers in regard to the supply of gas.

Third Thirlmere Conduit to Manchester.—The Manchester Water Committee have completed arrangements with Messrs. G. H. Hill and Sons for the construction of the third conduit from Thirlmere; and the work will be begun as soon as possible. The Committee have also decided to appeal against the increased assessment of the works at Thirlmere made by the Assessment Committee of the Cockermouth Council, consequent on the raising of the level of the lake for supplying the new pipe. The increase in the rateable value is from £4450 to £8500.

Water-Works Loan for Heanor.—An inquiry on behalf of the Local Government Board was held by Major J. Stewart at Heanor last week, into an application by the Urban District Council for sanction to borrow £1000 for the purposes of the water undertaking. Part of the amount is required for furnishing certain outlying districts with water; and the Inspector suggested that the application should be amended so as to specify £490 for mains and £510 for Engineers' fees, excess cost of works carried out, &c. The source of the Council's water is Meerbrook Sough; and the present supply is about 400,000 gallons a day.

Price of Gas to Large Users at Cleckheaton.—The Cleckheaton Urban District Council have been discussing the price of gas to different classes of consumers. A Sub-Committee who had had the question under consideration for some months, proposed that there should be a general reduction of 2d. per 1000 cubic feet, and also that there should be an extra reduction of 4d. per 1000 feet to large users for manufacturing purposes (with a minimum consumption of 500,000 cubic feet). There were other minor recommendations affecting the use of slot meters, &c. The result of the discussion was that the recommendations of the Sub-Committee were adopted, with the exception that the extra reduction of 4d. is to apply to all trade users without limitation.

Chertsey Gas Consumers' Company, Limited.—The annual general meeting of this Company was held last Tuesday—Mr. W. Moir (the Chairman) presiding. The balance available for distribution was £3229; and the Directors recommended the payment of dividends of 12 per cent. per annum on the original and "A," "B," and "C" shares, and 9 per cent. per annum on the new "D," "E," and "F" shares. The Chairman, in moving the adoption of the report, congratulated the proprietors on having had so satisfactory a year's work as was shown by the accounts presented. The report was unanimously adopted. A vote of thanks was accorded to the Manager (Mr. J. Hamilton) and the Secretary (Mr. J. Moir); and it was acknowledged by the latter. A similar compliment to the Chairman brought the meeting to a close.

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CARRON COMPANY · SUD PERFERVIA · INCORPORATED BY ROYAL CHARTER 1773 · FOUNDED 1759

Depth of Gas-Mains at Southampton.

At the meeting of the Southampton Town Council last Wednesday, the Works Committee reported having conferred with a deputation from the Southampton Gas Company, consisting of the Chairman (Captain A. J. Corse-Scott, J P.), the Consulting Engineer, the Resident Engineer and Manager, and the Secretary, respecting the decision of the Council that gas mains should not be laid at a less depth than 2 ft. 6 in. from the surface of the road. The Chairman stated that they had no objection to the laying of pipes at this depth in main roads and 2 ft. 3 in. in subsidiary roads. The deputation having retired, it was proposed that the Committee adhere to their previous resolution, requesting the laying of mains at a depth of 2 ft. 6 in. in all roads. It was moved, as an amendment, and resolved, to recommend the Council to agree to the Company's proposal – exceptional cases, in which greater depths might be necessary, being dealt with as circumstances required. Alderman Button having proposed the adoption of the report, Mr. Lewis proposed, as an amendment, that the Council should adhere to their previous decision. He said that, in view of the explosion at Northam, which was in a subsidiary road, they should pause before sanctioning any alteration. Mr. Weston said the explosion referred to was not due to the depth of the main, but to it being over an old sewer; and if they could not agree to the depth, they would have to go to arbitration, which would mean expense for a trivial matter. After a brief discussion, the amendment was carried.

Lincoln Water Supply.

The "Lincoln Mercury" states that it is about two months since the Lincoln Water-Works Committee began to pump the water from the new deep bore at the Boultham works; and the public of Lincoln are now beginning to realize, what the Committee have from the first feared, that the water will not be available for a domestic supply. The water has been pumped to waste almost continuously since the beginning of October, in the hope that the quality would improve; but though there has been some improvement, the water is still regarded as unfit to be turned into the mains. A very eminent authority thinks there is still hope that the "fault" may be worked out, and that the water may eventually become as good as the red sandstone water has been found elsewhere. There is a growing feeling, however, that the Corporation should now cease to spend more money in pumping the water to waste, and that they should let it overflow and run away as it did when first the water-bearing strata were tapped. If after a time it is found to be of satisfactory quality, so much the better for the city; but at present it looks as if many thousands of pounds have been expended in vain, and the authorities will have to embark on some other scheme for providing the citizens with a safe water. Last Friday the City Council met in Committee, and resolved to proceed with the building of a new covered reservoir on Cross o' Cliff Hill, with a capacity of 6 million gallons, equal to a three days' supply; and also a water tower in Westgate. These works, it is estimated, will involve an expenditure of something like £50,000.

London County Council and Gas-Meter Testing.—At the meeting of the London County Council last Tuesday, the report of the public Control Committee on the subject of gas-meter testing (*ante*, p. 625) was received, and their recommendation adopted.

Flintshire and the Birkenhead Water Scheme.—At the meeting of the Holywell Rural District Council on Friday, a letter was read from the Urban District Council with regard to the Birkenhead Corporation's scheme to obtain water from the River Alwen, for which they intend to apply for parliamentary powers next session. The letter stated that the Urban Council had had under consideration the desirability of asking the Corporation if they would be prepared to entertain an application to supply water in bulk to the town of Holywell. The Corporation main would pass Northop, in the Rural Council's area, and it might be to the mutual advantage of the two Councils if an arrangement could be made to extend the main in their direction. It was suggested that a Joint Committee of the two Councils should meet to discuss the subject.

Coventry and the Gas Supply of Allesley.—The Gas Committee of the Coventry Corporation have received a report from the Engineer and Manager (Mr. Fletcher W. Stevenson), to the effect that Mr. Iliffe has agreed to the terms of the Committee with respect to the proposed extension of the gas-mains to Allesley, to which reference has already been made in the "JOURNAL." The terms are that—(1) Mr. Iliffe is to pay one-third of the cost (amounting to £693) of laying the mains from the city boundary to Allesley; and (2) to give a guarantee to the Corporation that for seven years the following quantities of gas (to be consumed in Allesley) shall be paid for: During the first year, 1,000,000 cubic feet, and during the second and subsequent years 1,120,000 cubic feet. The Committee have accordingly resolved that, subject to an agreement, to be prepared by the Town Clerk, the mains be extended to Allesley accordingly. This resolution will come before the Council to-day for confirmation.

Gas Exhibition in Hereford.—Under the auspices of the Hereford Corporation Gas Committee, an exhibition of gas stoves and fittings, both for heating and lighting purposes, was opened at the Town Hall last Tuesday. There was a large attendance at the inaugural ceremony, which was performed by the Mayor (Mr. G. J. Caldwell). The Chairman of the Gas Committee (Mr. C. Witts) having given some particulars as to the progress of the gas undertaking, the Mayor added a few appropriate remarks, and then declared the exhibition open. The arrangements were carried out by the Gas Engineer and Manager (Mr. W. W. Townsend), who brought together a very representative collection of gas cooking, heating, and lighting appliances. Two model rooms, one fitted up as a dining-room and the other as a sleeping apartment, served to show the purposes for which gas can be employed. An improved method of street lighting was displayed outside the hall. Miss M. Weston gave a course of practical lectures on cooking every morning and afternoon. The exhibition closed on Saturday.

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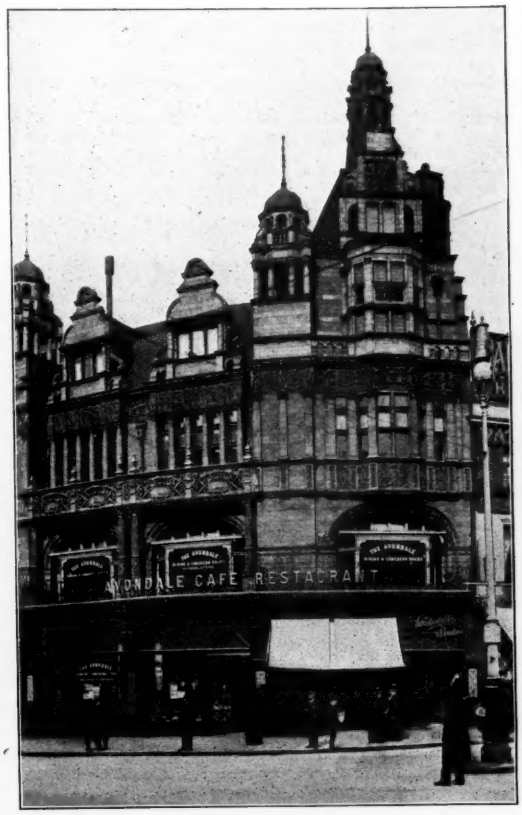

Messrs. Kirkland Bros., Cafe Restaurant, Liverpool.

Another Building in which our **"St. Andrew"** **Gas-heated Steam Radiators** are in use.

Reduction in Price in East Hull.—The Sutton, Southcoates, and Drypool Gas Company will, on the 1st of January next, reduce the price of gas consumed in their district from 2s. 4d. to 2s. per 1000 cubic feet; and this figure will stand until further notice. This reduction is in addition to the 2d. conceded on the 1st of April, so that the consumers in East Hull are benefiting to the extent of 6d. per 1000 cubic feet during the year; and the price all over Hull—*i.e.*, the areas of the British and Sutton Companies—will be the same. The price charged by the Corporation in their area, which is that of the old Kingston-upon-Hull Gas Company, is 2s. 6d. In accordance with the provisions of the Act obtained in the earlier part of the session, the Sutton Company's name will be changed to the East Hull Gas Company on the above-named date.

Cheaper Gas and Increased Consumption at Youghal.—The Urban District Council of Youghal have decided to reduce the price of gas to 3s. 4d. per 1000 cubic feet for all purposes. This is the latest of a series of reductions which have been made in the six years during which the present Manager (Mr. Robert Young) has held the position. In 1901, the all-round price was 5s. 10d.; but the following year it was brought down to an even 5s, and 1s. 3d. less for gas used for cooking purposes. In 1903, 3d. was taken off the price for lighting; in 1904, a like amount for both lighting and cooking; and now the levelling-down already mentioned. The effect of this liberal policy on the part of the Gas Committee has been an increase to the extent of 106 per cent. in the consumption of gas; and the good management which has been associated with that policy has been recognized by the presentation of a bonus of £10 to Mr. Young.

Gas-Stoves at the Cookery Exhibition.—The Exhibition of Food and Cookery which was opened last Tuesday in the Royal Horticultural Hall, Westminster, by the Duchess of Albany, calls for brief notice in our columns from the fact that it furnished fresh evidence of the supersession of the old coal-fire by the gas-stove in culinary operations. "The grimy old saucepans, with their inevitable exterior coating of coal dust," are also, as remarked by one of the London morning papers, giving place to bright-looking enamel, nickel, and aluminium cooking utensils. The features of the exhibition, from our readers' point of view, were the model kitchens fitted up with gas cooking-stoves of all sizes, and equipped with the latest appliances. During the period of the exhibition, which closed on Saturday, lectures were delivered and demonstrations given on a variety of culinary subjects; and a sum of £1250 was offered in prizes to the successful candidates in the various competitions.

A Gas Show-Room for Leek.—The Leek Urban District Council recently decided to arrange for the Richmond Gas Stove and Meter Company, Limited, to open a show-room in the town for the display of gas-fittings, cooking apparatus, &c., and to supply gas free to the Company for a year; one of the stipulations being that "fittings exhibited will be supplied through, and fitting-work can be done by, the local authorized gas-fitters," and "the Council are not to bind themselves to purchase exclusively from the Richmond Gas Stove and Meter Company, Limited, but to reserve the right to buy from any other makers if they think fit." On the proposal being objected to as unfair to local tradesmen, on the ground that it would be granting a monopoly to one maker, a member said he could not see how it would do local tradesmen harm. The Company would not sell the articles on view, for all goods would have to be obtained through local dealers. Eventually the arrangement was sanctioned.

The Jerusalem Church, South Kensington, and St. Matthew's Church, Ponder's End, have recently installed, for heating their buildings, Richmond's gas-steam radiators. In the former church, ten 14-tube radiators were fixed; and in the latter, fourteen of various sizes. Ten of the radiators have also been fixed in the Finchley Town Hall.

According to "Engineering Record," water-meters have proved decidedly economical at a Philadelphia factory, where about 18½ million gallons were used last year. At the regular meter rate, this supply cost $904. Without meters the charge for boiler feed-water only would have been $1500 on the usual rating, and about $400 would have been charged under other items in the schedule.

A Dover correspondent to the "Financial News" states that the first seam of coal was struck last Wednesday at the new boring by the Concessions Company at Fredville, between Canterbury and Dover. The seam, which is 18 inches thick, is of bright bituminous quality, and was found 400 feet nearer the surface than at Waldershare, three miles to the southward, where 10 feet of coal was struck recently.

Striking testimony of the popularity of incandescent gas lighting and the extensive business carried on by the United Chemical Works, Limited, is furnished by the certificate forwarded by Messrs. Maurice Jenks, Nye, and Co., Chartered Accountants, to Mr. Julius Norden, the Managing-Director. This is to the effect that the United Chemical Works, in conjunction with Messrs. Julius Norden and Co., have supplied 590,762 "Ino" mantles to one of the largest City Corporations in the kingdom.

According to a Reuter telegram from New York, the Standard Oil Company's foreign department has issued an appeal for the same encouragement at home as foreign oil combinations receive from their Governments. It calls attention to the amalgamation of the Royal Dutch Company, of The Hague, with the Shell Transport and Trading Company, of London, among other foreign combinations which are regarded abroad as being in the natural pathway of legitimate economic and progressive commerce.

The formal inauguration of the new recreation room which has been provided by the Birmingham Gas Committee for the men employed by the department will take place next Thursday, and the Lord Mayor is to be asked to perform the opening ceremony. The building has been erected in Devon Street, on land belonging to the department; and, together with the necessary equipment, it will involve an expenditure of about £3500. It is to be used by the employees for social and recreative purposes; the principal room being of sufficient capacity to accommodate 400 people.

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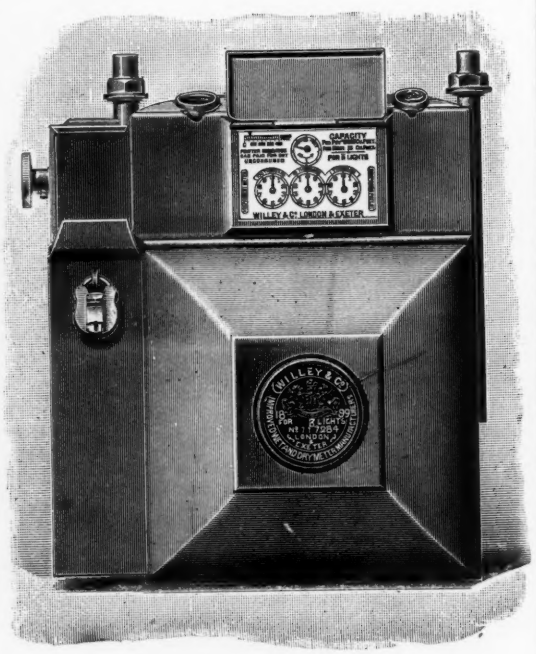

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The briquette industry of Liége has become important, the exportation reaching almost all the coal-consuming countries of the world. It amounted for the first seven months of the present year to 253,911 tons, of which France received 110,036 tons, the United States 46,700 tons, and Germany 32,514 tons.

We learn that the heating of the Wesleyan Church, Great Junction Street, Leith, and also of the Episcopal Chapel, Torry, Aberdeen, is being done exclusively by Messrs. John Wright and Co.'s "St. Andrew" gas-heated steam-radiators. This is a branch of work for which appliances of this kind are specially suitable.

The machinery at the new works of the Gilbert Little Company, Limited, Bradford, has been started, beginning with contracts for coal-conveying plant for the gas-producers at the new power-houses for the tramways at Winnipeg, Canada, and Bahia, South America; the Società Industriale Italiana, Rome; the Crookston Phosphate Mines, Tunis, North Africa; the Bradford Dyers' Association, Limited, for their Heckmondwike and Brownroyd works; the Slag Reduction Company, of Middlesbrough; the Manchester Book-Cloth Company; and the Creosote Works, of West Hartlepool.

Mr. Justice Warrington had before him a few days ago the petition of the South American Light and Power Company, Limited, for the reduction of their capital by £50,000, by substituting for every £2 fully-paid share one fully-paid £1 share. The Company carried on business in the Argentine; the original capital being £100,000. His Lordship sanctioned the reduction.

Mr. A. Leslie Bucknall, a member of the Aëro Club of Great Britain, left the Wandsworth Gas-Works last Tuesday afternoon in his balloon Vivienne IV., crossed the Channel to Le Touquet, passed Amiens, Rheims, and Chaumont during the night, and descended at daybreak on Wednesday at Vevey, on the Lake of Geneva—performing a voyage of about 430 miles in 16 hours.

It is reported that the Crigglestone Colliery, near Wakefield, which was stopped early this year owing to lack of capital, is to be reopened shortly; the property having been purchased by a new Company, in which the largest shareholder is the Otto-Hilgenstock Coke-Oven Company. The nominal capital of the new Company is £60,000. Fresh seams of coal are to be worked, and a large battery of coke-ovens is to be put down, and bye-products dealt with.

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ANALYTICAL CHEMIST. Cardiff Gas Company. Applications by Dec. 10.
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Stocks and Shares.

DERBY GAS COMPANY. Dec. 12.
LEA BRIDGE GAS COMPANY. Dec. 11.
WEST HAMPSHIRE WATER COMPANY. Dec. 11.
WYMONDHAM GAS COMPANY. Dec. 11.

TENDERS FOR

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HALIFAX GAS DEPARTMENT. Tenders by Dec. 19.
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HALIFAX GAS DEPARTMENT. Tenders by Dec. 19.

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HALIFAX GAS DEPARTMENT. Tenders by Dec. 19.

Pipes, &c.

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BRIDGEWATER COLLIERIES COKE WORKS. Tenders by Dec. 20.
HECKMONDWIKE GAS COMPANY. Tenders by Dec. 17.
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HALIFAX GAS DEPARTMEFT. Tenders by Dec. 19.

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No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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WANTED, immediately, at a Coke-Oven and Bye-Product Plant in South Yorkshire, a young CHEMIST versed in Fuel Analysis.
Apply, stating Age, Experience, and Salary expected, to No. 4680, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, on Jan. 1, a Working MANAGER for Stony Stratford Gas-Works. Make about 6 Millions. Salary, 30s. per week, with House, Coal, and Gas, and 10s. per quarter for indexing meters.
Applications, stating Age and Experience, and enclosing not more than Three recent Testimonials, to be sent to the Chairman of the Company, Mr. W. R. Parrott, Stony Stratford, on or before Thursday, the of December, inst.
Wm. J. C. Ray,
Secretary.
Stony Stratford,
Dec. 1, 1906.

THE Cardiff Gaslight and Coke Company require a qualified ANALYTICAL CHEMIST, who must be conversant with Gas Testing by the Table Phometer, Modern Gas-Works Analyses, including Coal Testing, also Tar and Ammoniacal Liquor Distillations, Calorimetry, and the other duties appertaining to that Department.
Salary to commence, £100 per annum.
Applications, addressed to the Chairman, stating Age, Experience, and present position, together with *copies* of not less than Three recent Testimonials, to be sent to the undersigned, endorsed "Chemist," not later than Monday, Dec. 10, next.
Canvassing directly or indirectly will disqualify.
By order,
George Clarry,
Secretary.
Gas Offices, Cardiff,
Nov. 17. 1906.

WANTED, a Gasholder of 40,000 feet capacity or Two at 20,000 (Steel Tank preferred).
Write Water Works, Lighting, and Power Investment Corporation, Limited, 99, Cannon Street, E.C.

PURIFIERS wanted, 10 feet, 12 feet, and 15 feet square Boxes. Gasholders up to 100,000 cubic feet capacity. Every description of Plant bought and dismantled. Scrap Buyers of old Meters, Brass, Copper, and other metals for Cash.
State Particulars and Quantities to Firth Blakeley and Co., Gas Plant Buyers, Dewsbury.

SUNBURY GAS CONSUMERS' COMPANY, LIMITED.
WANTED, Two Second-Hand Boilers (Cornish Type), from 12 to 14 feet long by 5 feet diameter. Working pressure 60 lbs. to square inch. Must stand test of 100 lbs. pressure.
For Particulars, apply to the Manager, S. Bark. Prices, endorsed "Boilers," to be addressed to the Chairman, H. H. Allen, Esq., Gas-Works, Sunbury-on-Thames.

FOR SALE.—A Second-hand Governor, with Four 8-inch Valves and Connections.
For Particulars apply to the Secretary, Gas Company, Leatherhead.

FOR SALE—A 50-Horse Power Stockport GAS-ENGINE, single Cylinder Type, fitted with Two 7 feet Fly Wheels and Outside Bearings on each end of Crank Shaft. Complete with Gas Bag, Silencer, Meter, Exhaust Piping, &c.
Apply to "G.S.," care of West End Advertising Agency, 195, Oxford Street, W.

FOR SALE.—A Quantity of miscella-neous good second-hand Gas-Works Material, including Special Castings, Valves, Dip-Pipes, Holder Pulleys, West's Charging Scoops, Charging and Drawing Tables, &c.
For Particulars, apply H. Wilkinson, Secretary and General Manager, Gas Company, Harrogate.

SLOUGH GAS AND COKE COMPANY.
THE Directors of this Company invite TENDERS for Surplus TAR for One Year. The estimated quantity produced is 50,000 Gallons per annum. The Company have a Railway Siding connecting their Works with the Great Western Railway, and the Grand Junction Canal has a Wharf close to the Works.
Price to be stated at the Company's Works.
The Directors do not bind themselves to accept the highest or any Tender.
Tenders to be delivered to me on or before Tuesday, the 11th prox.
Arthur Thomas,
Secretary.
High Street, Slough,
Nov. 23, 1906.

CORPORATION OF LEICESTER.
(Gas and Electric Lighting Department.)
CAST-IRON PIPES.
THE Gas and Electric Lighting Com-mittee of the above Corporation are prepared to receive TENDERS for the supply and delivery of the necessary CAST-IRON PIPES and CONNECTIONS, from 2 to 36 inches in diameter, required during the Twelve Months ending Dec. 31, 1907.
Specifications and Form of Tender can be obtained upon application to the Engineer.
Tenders, addressed to Mr. Councillor Edwards, Chairman, and endorsed "Tender for Cast-Iron Pipes, &c.," to be delivered at these Offices not later than Eleven o'clock a.m. on Saturday, Dec. 8, 1906.
The Committee do not bind themselves to accept the lowest or any Tender.
Alfred Colson, M.Inst.C.E.,
Engineer and Manager.
Offices: Millstone Lane,
Leicester, Nov. 24, 1906.

CORPORATION OF LEICESTER
(Gas and Electric Lighting Department.)
RETORTS AND FIRE-BRICKS.
THE Gas and Electric Lighting Com-mittee of the above Corporation are prepared to receive TENDERS for the supply and delivery of RETORTS and FIRE-BRICKS for the Year 1907.
Specifications, Quantities, and Form of Tender can be obtained upon application to the Engineer.
Tenders, addressed to Mr. Councillor Edwards, Chairman, and endorsed "Tender for Retorts, &c.," to be delivered at these Offices not later than Eleven o'clock a.m. on Saturday, Dec. 8, 1906.
The Committee do not bind themselves to accept the lowest or any Tender.
Alfred Colson, M.Inst.C.E.,
Engineer and Manager.
Offices: Millstone Lane,
Leicester, Nov. 24, 1906.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. Blakeley, Gas Engineer, Thornhill, Dewsbury.

BRECON GAS COMPANY.
TENDERS are invited for the Surplus TAR and LIQUOR produced at these Works, delivered into Tank-Waggons at Brecon Railway Station, for One Year ending December, 1907.
Probable quantity, 120 Tons of Tar and 250 Tons of Liquor of varied strength.
The Directors do not bind themselves to accept the highest or any Tender.
Separate sealed Tenders to be delivered, addressed to the Directors of the Company, on or before Tuesday, Jan. 1, 1907.
Wm. A. Wright,
Secretary.
Brecon, Nov. 29, 1906.

HECKMONDWIKE GAS COMPANY.
THE Directors of the above Company invite TENDERS for the purchase of surplus TAR and AMMONIACAL LIQUOR produced at their Works during the Twelve Months ending Dec. 31, 1907.
Particulars and Conditions of Contract may be obtained from the Manager, Mr. F. D. Richmond.
Tenders, endorsed "Tar and Liquor," to be addressed to the Chairman, Mr. J. J. Stead, and sent in not later than the 17th inst.
The Directors do not bind themselves to accept the highest or any Tender.
By order,
Ernest Benn,
Secretary.

BRIDGEWATER COLLIERIES COKE-WORKS.
(The Earl of Ellesmere.)
TENDERS are invited for the Tar pro-duced at the above Works for a period of Six or Twelve Months from the 1st of January, 1907, delivered into Contractor's Tanks at the Bridgewater Colliery Siding, Wharton Hall, on the Pendleton and Hindley Branch of the Lancashire and Yorkshire Railway; or at the Brackley Siding, Little Hulton Mineral Branch, of the London and North-Western Railway.
The estimated quantity is about 2600 Tons per annum.
Tenders, endorsed "Tender for Tar," to be addressed to Mr. Thomas M. Brown, Bridgewater Coal Offices, 4, Chapel Walks, Manchester, not later than the 20th of December.
Manchester, Nov. 27, 1906.

COUNTY BOROUGH OF HALIFAX.
THE Gas-Works Committee of the Halifax Corporation invite TENDERS for the supply of—

1. IRONMONGERY.
2. STEEL GOODS.
3. FIRE-CLAY GOODS.
4. TARRED GASKIN, &c.
5. IRON VALVES and CONNECTIONS.
6. WET and DRY GAS METERS.
7. CLOTHING & CAPS.

required during the year ending Dec. 31, 1907.
Forms of Tender and further Particulars may be obtained on application to Mr. John Wilkinson, F.C.S., Engineer, Gas-Works, Halifax.
Tenders, endorsed "Gas-Works," together with the names of the articles tendered for, must be sent to the undersigned not later than Ten o'clock a.m. on Wednesday, the 19th day of December, 1906.
The persons whose Tenders are accepted will be required to observe the Fair Contracts Clauses adopted by the Corporation.
The Committee do not bind themselves to accept the lowest or any Tender.
By order,
Keighley Walton,
Town Clerk.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.
NOTICE is Hereby Given, that the TRANSFER BOOKS of the Company, so far as they relate to DEBENTURE STOCK, WILL BE CLOSED at Ten o'clock in the forenoon on Friday, the 14th of December for the Half Year ending the 31st of December, 1906, and will be RE-OPENED on Friday, the 21st of December.
The Interest for the Half Year will be payable on the 1st day of January next to the proprietors registered on the closing of the Books.
By order of the Board,
James Randall,
Secretary.
Chief Offices: 639, High Road,
Tottenham, Nov. 30, 1906.

DERBY GASLIGHT AND COKE COMPANY.
ISSUE OF £10,000 ORDINARY (CONSOLIDATED) STOCK.
THE Directors of the above Company have Instructed
Messrs. CUMBERLAND, BROWNSON, & PAGE to offer for SALE BY AUCTION at the Company's Offices, Friar Gate, Derby, on Wednesday, the 12th day of December, 1906, at Twelve o'clock at noon precisely, subject to such conditions as shall be then produced—
£10,000 ORDINARY (CONSOLIDATED) STOCK in the Derby Gaslight and Coke Company, in Lots, to the highest bidder at a premium.
The Stock will be sold in Lots of £100 each, nominal value, and the premiums will be payable at the Sale.
The nominal purchase money for the Stock will be payable on the 1st of January, 1907.
Further Particulars and Conditions of Sale may be had on application to the undersigned, or of the Auctioneers, The Wardwick, Derby.
H. Bullivant,
Secretary.
Gas Offices, Derby,
November, 1906.